Platelet Incubator Service Manual

i.Series™ and Horizon Series™

	i.Series	Horizon Series
Countertop models Ver. A	**PC100i** **PC900i** **PC1200i**	**PC100h** **PC900h** **PC1200h**
Floor models Ver. A	**PC2200i** **PC3200i** **PC4200i**	**PC2200h** **PC3200h** **PC4200h**

Model _____

S/N _____

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About this manual

Intended audience

This manual is intended for use by both incubator operators and qualified service technicians. This manual is to be used in conjunction with the Incubator Operation Manual.

References

See the manuals below for supplemental information:

Platelet Incubator Operation Manual
Temperature Chart Recorder Operation and Service Manual
Flatbed Agitator Operation Manual.
Flatbed Agitator Service Manual

Symbols and conventions

Cautions

A Caution is used to call attention to a condition or possible situation that could damage or destroy the equipment or the operator's work.

CAUTION	Follow all chemical handling and disposal requirements and procedures specified by your organization.

Notes

Notes contain additional information about a topic. Notes are used to provide information about how a topic relates to another topic, or background information about a design characteristic.

NOTE	Spare parts are available for purchase through Helmer.

Model references

Generic references are used throughout this manual to group models that contain similar features. For example, "PC100" refers to both the i.Series (PC100i) and Horizon Series (PC100h) models. If a feature or procedure applies to a specific model or a specific voltage, it is stated as such.

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1 Safety

1.1 Avoiding injury

- ► Use the equipment for its intended purpose. Do not use if any components are damaged.
- ► Review safety instructions before installing, using, or maintaining the equipment
- ► Before performing procedures, review any specific safety instructions.
- ► Perform maintenance described in this manual. Maintenance not specified herein is to be performed by technical service representatives authorized by Helmer.
- ► Never physically restrict any moving component. Do not move or bump the unit during operation.
- ► Lift safely. If too heavy or awkward, get assistance.

CAUTION

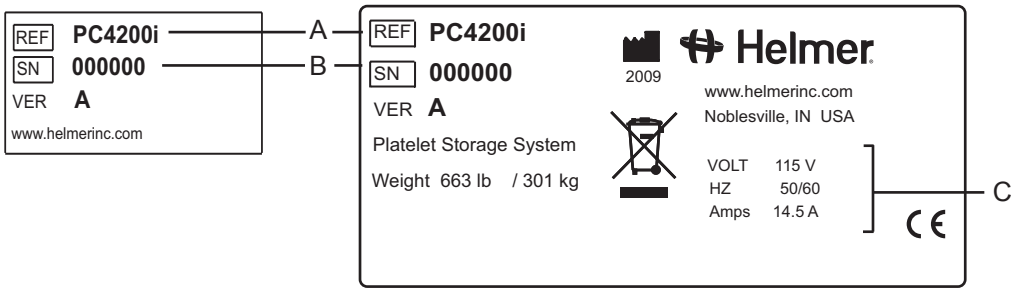
- ► The incubator may be too heavy or awkward to move alone. Get assistance as needed.
- ► Countertop models: When moving the incubator, do not use the water evaporation tray on the back as a handle. Avoid contact with the tray as it may be hot.
- ► Floor models: Before moving the incubator, ensure that all the casters are unlocked and the doors are closed. When moving the incubator, push from the sides, not from the front or back. Pushing from the front or back could cause the incubator to tip if the wheels become stuck.

- ► When attaching or using external devices, follow manufacturers' safety rules.
- ► Inspect all electrical equipment and address problems prior to installation.
- ► Avoid removing electrical service panels and access panels unless so instructed.
- ► Use supplied power cords only.
- ► Avoid using multi-plug power strips. Connect directly to properly grounded wall outlets.
- ► Use appropriate protective equipment when cleaning or servicing the equipment
- ► Notify appropriate safety personnel when handling or disposing of materials that are infectious, toxic, pathological, radioactive, or otherwise biologically or environmentally harmful.

CAUTION Decontaminate parts prior to sending for service or repair. Items not decontaminated appropriately will not be accepted. Documentation stating contents are not contaminated and are safe to handle must accompany returns. Contact Helmer or your distributor for decontamination instructions and a Return Authorization Number.

2 Configuration

2.1 Model identification and power requirements



Left: Chamber label. Right: Product specification label (rear of incubator).

Label	Description
A	Model (REF)
B	Serial number (SN)
C	Power requirements (see Operation manual)

2.2 Powering on

Use only the power cord(s) supplied. Long cords connect incubators to outlet power. Shorter cords provide power to Helmer agitator(s) installed inside incubator.

NOTE: In PC4200 models, the agitator is built in. When powered on, agitator motion begins, and the motion alarm backup battery starts to charge.

CAUTION Ensure incubator is at room temperature before connecting to power.

1. Connect the long cord to the power connector on the incubator.
2. Plug the other end into a grounded outlet meeting specified power requirements.

NOTE: Initially chamber temperature may exceed the high alarm setpoint, activating an audible alarm. When normal operating temperature is reached, the alarm clears automatically. Mute the alarm as needed.
For i.Series, each power on requires selection of display language. The system stores two languages. By default, English is selected. If a different language is desired, it must first be loaded from the flash memory card. If a card is not included with the incubator, the distributor may have loaded languages prior to shipment. See flash memory card documentation or contact Helmer or your local distributor.

i.Series

1. Confirm incubator is connected to AC power.
2. Open the control door and switch main power ON (|). The monitor engages and SYSTEM OPTIONS displays. Select a previously loaded language by pressing the INC or DEC buttons.
3. Press the HOME button, and the display text changes to the selected language.
4. If an alarm sounds, press the MUTE button on the i.Center.

Horizon Series

1. Confirm incubator is connected to AC power.
2. Open control door and switch main power ON (|). The chamber temperature displays on the controller.
3. If an alarm sounds, press the MUTE button, located next to the backup battery.

Enable/disable audible alarms with key switch

NOTE: Disabling sound with a key switch does not disable alarm messages, controller lamps, or signals sent through the remote alarm interface. Photos below shows key switch positions.

Left: Mute button (circled) on PC100h. Middle: Key switch PC100h. Right: Key switch PC4200h.

2.3 Backup power systems

Some incubator systems have battery backups, enabling operational continuity for a specified period once AC power is lost.

i.Center monitor backup

On backup power, the i.Center continues to monitor incubator status and activate alarms as appropriate. **NOTE**: AC power must have previously been turned on to charge the battery backup system.

Battery life varies by manufacturer and voltage level remaining. Provided no battery-related alarms are active and battery charge is at maximum, backup power for the i.Center is available for about two hours. Six 1.5 V D-cell alkaline (or equivalent) batteries are located under the access panel on top of the incubator.

CAUTION Removing the access panel exposes users to the risk of electric shock.

1. Turn off the incubator and disconnect it from AC power.
2. Confirm backup batteries are installed. The system is located on incubator top under the access panel.
3. Open the control door and turn the key switch ON (|).

Power failure alarm (Horizon Series)

► Confirm the backup battery for the power failure alarm is installed and the leads are connected.

The battery is located behind the control door. Depending on the model, it may be necessary to connect the leads to the battery. The power failure alarm system uses a single non-rechargeable 9 V alkaline (or equivalent) battery.

Motion alarm (PC4200)

The PC4200 has a built-in agitator with a motion alarm system independent of other alarms on the incubator. This system has a rechargeable battery backup which charges continuously while the incubator is on and receiving AC power.

Agitation stops if the incubator loses AC power. However, the backup continues to power the monitoring system, including activating the motion alarm, once the motion alarm delay period elapses. The amount of time the alarm system functions on battery power alone depends on battery charge remaining.

1. Turn off the incubator and disconnect from AC power.
2. Confirm the motion alarm backup battery is installed under the access panel on top of the incubator.
3. Connect the incubator to AC power and turn on. The motion alarm backup battery begins to charge.

2.4 Configuring incubator setpoint

The default setpoint is 22.0 °C. The temperature controller adjusts chamber temperature around the setpoint, and within the incubator's temperature control range. When chamber temperature is below setpoint, the controller activates the heater. When temperature rises above setpoint, the controller activates the compressor to cool the chamber.

CAUTION Do not change the setpoint to a value outside the temperature control range.

Open the control door to access the temperature controller. The current chamber temperature displays. The temperature may be different from the setpoint, especially if the chamber temperature has not yet stabilized.

Temperature controller display and buttons

1. On the controller, access the setpoint adjustment function. Press and hold the (∗) button at left. The controller displays current setpoint value.
2. While holding the (∗) button, use the middle and right buttons to increase or decrease setpoint in increments of 0.1 °C.
3. When finished adjusting the setpoint, release all buttons. The setpoint is changed.

2.5 Preparing the chart recorder

1. Open the TCR door and connect leads to the 9 V non-rechargeable alkaline backup battery.
2. Verify the temperature range setting for incubators: 0 °C to 35 °C.
3. Install chart paper (provided).
4. Run a test pattern to verify TCR is working correctly.
5. Calibrate chart marks to match TCR probe temperature reading.

2.6 Installing agitator(s)

NOTE: This section does not apply to the PC4200 model, which has a built-in agitator.

2.6.1 Model compatibility for Helmer agitators and incubators

i.Series countertop agitators (PF15i, PF48i, and PF96i) have a built-in motion alarm system and can be placed in either Series incubators. When agitator motion is not detected, the alarm sounds.

When an i.Series incubator and an i.Series agitator are paired, agitator motion can be monitored by the AgiTrak system. The AgiTrak system receives alarm information through a direct connection *with the agitator's alarm system*, and the incubator communicates those alarms.

An i.Series agitator placed in a Horizon Series incubator *cannot* be monitored by the incubator. If the agitator stops moving, the alarm on the i.Series agitator sounds *inside* the incubator, so the sound level may be lower than desired. An extension to the alarm system is desirable for this configuration.

Horizon Series agitators (PF15h, PF48h, and PF96h) are not equipped with motion alarms, but may be placed in any Series incubator. Without motion alarms, Horizon Series agitator motion cannot be detected by AgiTrak.

CAUTION The maximum current draw for each internal incubator outlet is 0.5 A. Do not plug in any device that exceeds this rating.

These agitators		Can be placed in these Helmer incubators
i.Series	PF15i	PC100h, PC100i
	PF48i	PC900h, PC900i
	PF96i	PC1200h, PC1200i, PC2200h, PC2200i, PC3200h, PC3200i
Horizon Series	PF15h	PC100h
	PF48h	PC900h
	PF96h	PC1200h, PC2200h, PC3200h

2.6.2 Agitator-incubator parameters

PC900i incubator with a PF48i agitator

PC100, PC900, and PC1200 incubators: single agitator. In the back of the incubator chamber, there is one power connector, and if the incubator is i.Series, one I/O (input/output) connector. The I/O connector is used to connect to the i.Series agitator I/O port.

PC2200 and PC3200 incubators: one agitator per roll-out shelf. Each shelf has a corresponding power connector and I/O connector. Open roll-out shelves one at a time to prevent tipping.

When installing an agitator on a shelf in PC2200 and PC3200 models, use the corresponding power connector (provided) to prevent obstructions from the power cord. When installing an i.Series agitator, use the corresponding I/O connector so agitation information will be tracked.

Obtain or perform:

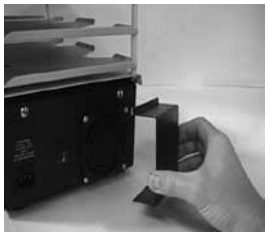
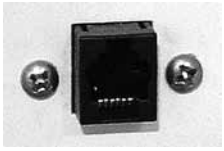
- ► Power cord. For each agitator, use the short power cord supplied with the incubator *instead of the cord supplied with the agitator*. Using the shorter cord assists proper placement and prevents obstruction.
- ► For PF15 models set up in PC100 model incubators, install the fan airflow deflector (provided). The deflector redirects airflow to maintain even chamber temperature.
- ► For i.Series model incubators: I/O (input/output) cable(s) (provided).

CAUTION

- ► Ensure agitator and incubator are at room temperature before powering on.
- ► Lift agitators from the ends. Lifting from middle may cause the frame to bow.
- ► Install agitators on roll-out shelves one at a time to prevent tipping.

For i.Series agitators

1. Confirm alarm system backup battery is installed.
2. Press alarm switch OFF to disable motion alarm.
3. Disconnect power to incubator.
4. For PF15 agitator set up in PC 100 incubator: Install fan airflow deflector
   - **a** Remove adhesive strip backing on the deflector.
   - **b** Position deflector so the open side faces the rear of the agitator. Press deflector in place around the fan.

Left: Installing the fan deflector on a PF15 agitator. Right: I/O connector inside an incubator.

5 Center agitator inside the incubator, and position so door(s) can close fully. Be sure agitator fan is not obstructed.
6 i.Series: Connect one end of the I/O cable to the agitator I/O port, and the other end to the corresponding incubator I/O connector.
7 Connect power cord to the agitator power connector, and also to the corresponding interior incubator outlet.
8 Connect incubator to outlet power. For i.Series agitators, the motion alarm battery backup starts to charge, and continues charging as long as incubator door(s) are closed.
9 Turn on the agitator and close incubator door(s). Verify agitator motion is unobstructed.

2.7 Connecting external monitoring devices

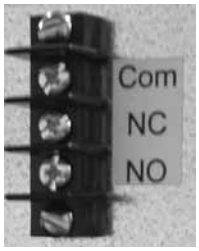
CAUTION Do not connect an external monitoring device that exceeds maximum load capacity for your model.

2.7.1 Remote alarm interface

The remote alarm interface is a relay switch with three terminals: Common (COM), Normally Open (NO), and Normally Closed (NC). These are dry contacts (they do not supply voltage). The interface circuit is either normally open or normally closed depending on which terminals are used.

NOTE: For PC2200i and PC3200i models, a bypass plug may be needed for a normally closed interface circuit. This plug is needed if multiple agitators are installed and not all the agitators are Helmer i.Series. For each position in which a non-Helmer i.Series agitator is installed, this plug must be installed in the I/O connector. To obtain a bypass plug, contact Helmer or your local distributor.

1 Disconnect incubator from AC power.
2 Do one:
   ► i.Series models: Behind the front control door, turn the key switch OFF (○) to disable backup power to the i.Center monitor.
   ► Horizon Series models: Disconnect the power failure alarm backup battery.
3 On the incubator rear, in the alarm output area, locate the remote alarm interface.



Remote alarm interface

4 Connect wires to the appropriate terminals according to the requirements of your alarm system.
5 Re-enable backup power and reconnect incubator to AC power.

3 Maintenance and cleaning

CAUTION

- ► Follow all chemical handling and disposal requirements and procedures specified.
- ► Testing and replacing backup batteries requires power disconnection.
- ► Protect stored items from extended exposure to adverse temperatures.
- ► Removing the access panel exposes users to the risk of electric shock.

3.1 Testing and replacing batteries

Regularly test battery function. Replace battery if test fails or if battery(ies) has been in use for one year.

Battery types for all backup systems

- ► i.Center monitor backup: Six 1.5 V D-cell non-rechargeable alkaline (or equivalent)
- ► Horizon Series, power failure alarm : One 9 V non-rechargeable alkaline (or equivalent)
- ► PC4200 motion alarm: One 9 V rechargeable Nickel-Metal Hydride (NiMH) (or equivalent)
- ► TCR: One 9 V non-rechargeable alkaline (or equivalent).

3.1.1 i.Center monitoring system

The monitor has visual indicators. The battery charge level is a pictorial representation of remaining battery life. If the batteries deplete to a particular voltage output, a flashing Low Battery alarm initiates. If the batteries are missing or close to depleted, the flashing No Battery alarm initiates.

Test backup batteries

- ► Disconnect incubator from AC power. The display should continue to relay information, although it may be harder to read. If the display is blank, replace the batteries and reconnect incubator to power.

Replace backup batteries

1. Turn off incubator and disconnect from AC power.
2. On the top of incubator, remove access panel.
3. Remove all six batteries and replace with six fresh batteries. Avoid reusing any battery.
4. Reinstall access panel.

3.1.2 Power failure alarm (Horizon Series)

Test the backup battery

- ► Disconnect the incubator from AC power. The power failure alarm should sound immediately. If it does not sound, replace the battery.

Replace the backup battery

1. Open the control door to access the battery and alarm key switch.
2. Disable sound for the power failure alarm.
   - ► (PC4200h models) Turn alarm key to Position 3.
   - ► (All other Horizon models) Turn alarm key OFF(○).
3. Remove the leads from the battery and remove the battery.
4. Install a fresh battery and reconnect the leads.
5. Enable the sound for the power failure alarm:
   - ► (PC4200h models) Turn alarm key to Position 1 or 2.
   - ► (All other Horizon models) Turn alarm key ON (|).

3.1.3 Motion alarm

Motion alarms are available on i.Series agitators, and on the PC4200 model incubator with built-in agitator.

Test backup battery

For i.Series models

1. Verify i.Center monitor backup power is enabled and that batteries have sufficient power.
2. Identify the delay period for the motion alarm, which is the Agitator 1 Setpoint. See Appendix A.

For Horizon Series models

1. Disconnect the leads to disable power failure alarm battery.
2. Identify the delay period - setting is at rear of incubator.
3. With the incubator turned on and agitating, disconnect AC power.
4. After the delay period has elapsed, the motion alarm activates. If it does not, replace the battery.

Replace backup battery

1. Turn off incubator and disconnect from AC power.
2. Remove the access panel on top of the incubator, .
3. Remove the battery and replace with a fresh battery.
4. Reinstall the access panel.
5. Reconnect the incubator to AC power. The battery charges when AC power is turned on.

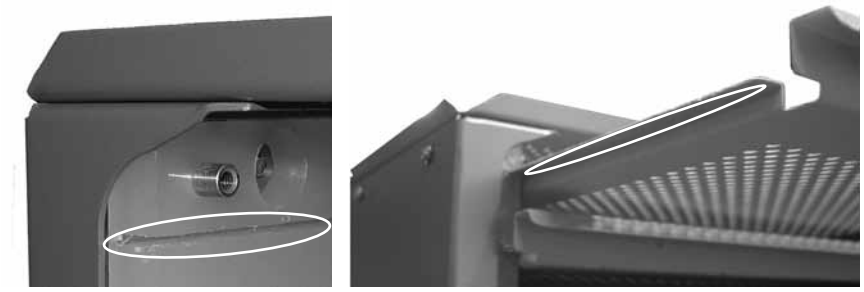
3.2 Maintaining moving parts on PC4200 built-in agitator

The PC4200 agitator has moving parts that must be kept clean and lubricated for proper operation. After extended periods of usage, some parts may require replacement by a qualified service technician.

Drawers

NOTE: When pulling out agitator drawers, grasp the drawer handle (not the label holder).

Keep the slots in the drawer guides free of debris. Lubricate the drawers as needed by applying a thin film of petroleum jelly underneath the sides of each drawer.



Left: Slot in drawer guide (circled). Right: Side of a drawer, with area to lubricate circled.

To remove a drawer

1. Grasp the center of the drawer handle and pull the drawer out until it stops, lifting lightly while pulling. At full open, the tabs on each side of the drawer are behind the spring loaded stops on drawer guides.
2. While pressing the stops, slide the drawer out until the tabs on the drawer are in front of the stops.
3. Continue pulling the drawer and remove it from the agitator storage frame.

Drawer in the full open position

Drawer with left tab in front of the stop

To install a drawer

1. Align the sides of the drawer with the slots in the drawer guide. Push the drawer into the storage frame until it stops.
2. While pressing the spring-loaded stops, slide the drawer into the storage frame until the tabs on the drawer are behind the stops.
3. Gently push the drawer all the way into the storage frame until it stops.

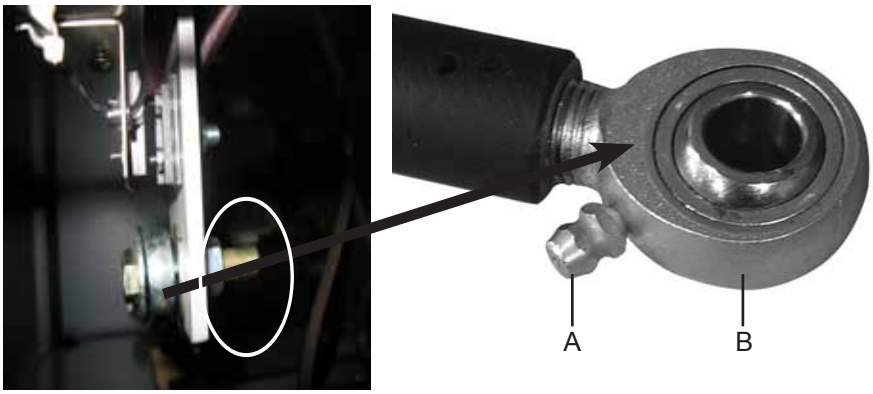
Drive shaft and bearings

The drive shaft, motor, and shaft bearings for the agitator are located inside the base. Check these items periodically for cleanliness and wear. The drive shaft has two bearings which must be lubricated.

Obtain a #2 Phillips-head screwdriver and a grease gun with bearing grease to lubricate the bearing on the end connected to the drive plate.

Procedure

1. Disable the power failure alarm:
   - ► PC4200i: turn the key switch OFF (○).
   - ► PC4200h: turn the key switch to Position 3.
2. Turn off incubator and disconnect from AC power.
3. Use the screwdriver to remove screws securing the side panels to the base.
4. Inject bearing grease into the fitting (see photos).
5. Reposition the panels on the base, then install and tighten the screws to secure.



Left: Drive shaft (circled). Right: Detail of drive shaft. A is the grease fitting, and B is the bearing.

Wheels

Inspect all wheels on the agitator periodically for cleanliness and wear. Use a #2 Phillips-head screwdriver to remove cover from front wheels. If wheels need replacing, contact a qualified service technician.

3.3 Replacing installed agitators

1. Turn off the incubator and disconnect from AC power.
2. Open roll-out shelves one at a time to prevent tipping. To remove the agitator:
   a. Disconnect the I/O connector (i.Series only) and power cord inside the incubator.
   b. Remove drawers to reduce the weight of the agitator.
   c. When lifting agitator, hold it on the ends rather than in the middle. Lifting from the middle may cause the frame to bow.
3. Install the new agitator.
4. If installing an i.Series agitator in an i.Series incubator:
   a. Confirm motion alarm settings.
   b. Reset the cycle counter.

3.3.1 i.Series: agitator cycle counter

Reset the agitator cycle counter before using a newly installed agitator. This ensures an accurate display of cycle count information, and the agitator maintenance reminder will appear at the proper time. When resetting the counter, status information records the count log for that particular agitator.

1. Access the AGITATOR INFORMATION screen: HOME --> MAIN --> i.Help.
2. Press the Down button to select Agitator Cycles.
3. On the AGITATOR TOTAL CYCLE COUNT screen, select the counter to be reset, and press Enter.
4. When the RESET AGITATOR screen appears, press Enter again. The counter is reset.

3.3.2 Agitator maintenance reminder

When the i.Center senses an agitator has run for a certain length of time (about 3 years, assuming continuous operation), a message displays a reminder to replace agitator wheels. Contact a qualified service technician for replacement.

NOTE: Whenever an agitator or wheels are replaced, be sure to reset the cycle counter to engage the reminder to display at the correct time.

3.4 Recharging refrigerant

CAUTION The procedures in this section should be completed only by trained refrigeration technicians who are familiar with the terminology and processes described here, as well as with local and organizational regulations regarding refrigerant leaks.

Use only non-CFC R134A refrigerant. The amount of the full initial charge varies by model.

Model	Initial charge
Countertop models (PC100, PC900, PC1200)	5.0 oz (142 g)
Floor models (PC2200, PC3200, PC4200)	8.0 oz (227 g)

NOTE: Use UV light to illuminate refrigerator line joint leaks. At a leak point, a bright film is present.

Obtain:

- ► Refrigerant of the appropriate type and quantity
- ► A calibrated pressure gauge capable of reading 0 lb/in² to 60 lb/in² (0 kPa to 400 kPa)

1 Attach the pressure gauge to the refrigeration line and measure the pressure.

2 Add refrigerant so the pressure lies within the acceptable range. Verify the pressure remains within the acceptable range after the chamber temperature has stabilized at 22 °C.

Ambient temperature		Low side pressure		
° C	° F	lb/in² (PSI)	kPa	bar
18	64.4	29.0	200	2.00
19	66.2	29.5	203	2.03
20	68.0	30.0	207	2.07
21	69.8	30.5	210	2.10
22	71.6	31.0	214	2.14
23	73.4	31.5	217	2.17
24	75.2	32.0	221	2.21
25	77.0	32.6	225	2.25
26	78.8	33.3	230	2.30
27	80.6	33.5	231	2.31
28	82.4	34.3	236	2.36
29	84.2	34.8	240	2.40
30	86.0	35.4	244	2.44

3.5 Cleaning the incubator

Condenser grill

The condenser grill must be cleaned regularly to maximize operation and protect incubator life expectancy.

Where the incubator is exposed to excessive lint or dust, the condenser grill may need to be cleaned more frequently than stated on the preventive maintenance schedule.

On countertop models, the condenser grill is located on the rear of the incubator. On floor models, the grill is located on the right side of the incubator. Clean the grill using a soft brush and a vacuum cleaner.

Exterior

Clean the exterior with a soft cotton cloth and a non-abrasive liquid cleaner. Clean glass surfaces with a soft cotton cloth and glass cleaner. For PF4200 models, clean the vents in the base as needed to maintain airflow and prevent the motor from overheating.

Interior

Clean stainless steel surfaces with a suitable general-purpose laboratory cleaner. Clean painted surfaces with mild detergent. Disinfect using a mild disinfectant solution. For PC4200 models, clean the textured drawer surfaces with a soft brush. Remove the drawers if needed.

Door gaskets

Clean door gaskets with a soft cloth and mild soap and water solution.

4 Troubleshooting

This section describes some problems that may occur, some possible causes, and some actions to take.

CAUTION Review all safety instructions prior to completing troubleshooting recommendations. See Section 1, “Safety.”

4.1 General operation problems

Problem	Possible Cause	Action
The display on the monitoring system is hard to read (i.Series).	The screen contrast is set too low.	► Change the screen contrast.
The monitoring system is not responding (i.Series).	Digital electronics are locked because of an interruption in power.	► Reset the monitoring system.
A roll-out shelf does not slide easily (PC2200 and PC3200).	There is debris in the shelf slides.	► Pull the shelf out and confirm the slides are free of debris. Clean if necessary.
	The shelf slides are not lubricated.	► Using a lightweight oil, lubricate the bearings in the slides.
	A shelf slide is faulty.	► Contact a qualified service technician.
A drawer does not slide easily (PC4200).	There is debris in the slots of the drawer guides.	► Pull the drawer out and confirm the slots are free of debris. Clean if necessary.
	The drawers are not lubricated.	► Clean and lubricate the drawers.
A door does not open easily (PC100 and floor models).	There is debris in the hinges.	► Confirm the hinges are free of debris. Clean the hinges if necessary.
	The door hinges are not lubricated.	► Using a general-purpose grease, lubricate the pivots in the hinges.
	A hinge cam is faulty.	► Contact a qualified service technician.
The hood does not open easily (PC900 and PC1200).	The damping cylinder or hood hinge is faulty.	► Contact a qualified service technician.
The incubator does not roll easily (floor models).	One or more casters are locked	► Unlock the casters. Push the incubator from the sides, not from the front or back.
The incubator is receiving AC power, and the doors are closed, but the built-in agitator is not moving (PC 4200 models).	The agitator is obstructed.	► Verify the agitator is free of obstructions.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.

Problem	Possible Cause	Action
Agitation is noisy or rough (PC4200).	The incubator is not level.	► Verify the incubator has been set up appropriately.
	Moving parts are grinding against each other.	► Verify that moving parts are lubricated and in good condition. Lubricate or replace them if necessary.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The main power switch is on, but nothing is working.	The outlet connection is faulty.	► Verify power at the outlet. Repair the original outlet or connect to a different outlet if necessary.
	The power cord is faulty.	► Check the condition of the power cord. Replace it if it is in poor condition. ► Check that voltage through the cord is appropriate. If it is not, replace the cord.
	The power connector is faulty (applies to all models except 115 V floor models).	► Check that connections between the power cord and power connector are secure. ► Check that voltage through the power connector is appropriate. If it is not, replace the power connector.
	A circuit breaker was tripped (applies to 230 V countertop models and all 115 V models).	► Confirm that all circuit breakers are seated. Push the circuit breaker to reset it if necessary.
	One or both fuses has blown (applies to 230 V floor models).	► Verify the fuse has not blown. Replace the fuse if necessary.
	The power line filter is faulty (applies to 230 V floor models).	► Verify power output from the filter. Replace the power line filter if necessary.
	The power switch is faulty.	► Verify power output from the switch. Replace the switch if necessary.
	The terminal board is faulty.	► Confirm the terminal board is supplying power to other components. Replace the terminal board if necessary.
The main power switch is on, but the temperature controller is not working.	The connection between the terminal board and temperature controller is loose or a part is faulty.	► Check the connections between the terminal board and the temperature controller. Secure the connections if necessary. Confirm the terminal board is supplying power to the temperature controller. Replace the temperature controller or terminal board if necessary.
The main power switch is on, but the compressor is not running.	The connection between the terminal board and the compressor is loose or a part is faulty.	► Check the connections between the terminal board and the compressor. Secure the connections if necessary. ► Confirm the terminal board is supplying power to the compressor by checking whether the condensing unit fan is working. Replace the terminal strip if necessary (applies to floor models only). Replace the starting relay coil, compressor/condensing unit, or terminal board if necessary.

Problem	Possible Cause	Action
The main power switch is on, but the chart recorder is not working.	The connection between the terminal board and the chart recorder is loose or a part is faulty.	► Check the connections between the terminal board and the chart recorder. Secure the connections if necessary. Confirm the terminal board is supplying power to the chart recorder. Replace the chart recorder or terminal board if necessary. See the Temperature Chart Recorder Operation and Service Manual.
The main power switch is on, and the doors are closed, but the built-in agitator is not agitating (applies to PC4200 models).	The doors are not closing completely.	► Confirm the hinge cams are not damaged. Replace if necessary. ► Confirm the door gaskets are sealing completely. Replace the door gasket if necessary.
	One or both door switches is faulty.	► Check the connections for the door switches. Replace one or both door switches if necessary.
	The secondary circuit breaker has tripped (applies to 115 V models).	► Confirm that all circuit breakers are seated. Push the circuit breaker to reset it if necessary.
	The agitation motor is faulty.	► Check the connections for the agitation motor. Replace the motor if necessary. On 230 V models, replace the capacitor for the motor if necessary.
	The terminal board is faulty.	► Confirm the terminal board is supplying power to the door switch or switches. Replace the terminal strip if necessary (applies to floor models only). Replace the terminal board if necessary.
The main power switch is on, and the door/ hood/doors is closed, but agitators installed inside the incubator are not agitating (applies to all models except PC4200 models).	The door(s) are not closing completely (applies to PC100 and floor models only).	► Confirm the hinge cams (floor models) or hinge bearings (PC100 models) are not damaged.
	The hood is not closing completely (applies to PC900 and PC1200 models).	► Confirm the damping cylinder is not damaged. Replace it if necessary. ► On the chamber wall in the hinge area, check the Nutsert for looseness. Replace the Nutsert if necessary.
	One or both door switches is faulty.	► Check the connections for the door switches. Replace one or both door switches if necessary
The main power switch is on, and the door/ hood/doors is closed, but agitators installed inside the incubator are not agitating (applies to all models except PC4200 models).	The terminal board is faulty.	► Confirm the terminal board is supplying power to the door switch or switches. Replace the terminal strip if necessary (applies to floor models only). Replace the terminal board if necessary.
	The secondary circuit breaker has tripped (applies to 115 V models).	► Confirm that all circuit breakers are seated. Push the circuit breaker to reset it if necessary.
	One or more interior outlets is faulty.	► Check the connections for the interior outlets. Replace one or more outlets if necessary.
	On the agitator, a component if faulty or internal connections are loose.	► See the Agitator Service Manual for information on how to proceed.

Problem	Possible Cause	Action
The main power switch is on, but one or both chamber fans is not running.	The chamber fan is faulty (applies to PC100 models only).	► Check the connections for the fan. Replace the fan if necessary.
	One or both chamber fan motors is faulty (applies to all models except PC100 models).	► Check the connections for the fan. Replace the fan motor if necessary.
A roll-out shelf does not slide easily (applies to PC2200 and PC3200 models).	A slide is faulty.	► Confirm the slide is operating correctly. Replace the slide if necessary.
A door does not open easily (applies to PC100 and floor models).	A hinge cam is faulty (applies to floor models only).	► Confirm the hinge cam is not damaged. Replace if necessary.
	A hinge bearing is faulty (applies to PC100 models).	► Confirm the bearings are not damaged. Replace if necessary.
The hood does not open or close easily or slams shut instead of gradually closing (applies to PC900 and PC1200 models).	The damping cylinder is faulty.	► Replace the damping cylinder.
	The hardware for the hinge is loose or faulty.	► On the chamber wall, check the Nutsert for looseness. Replace the Nutsert if necessary.
Agitation is noisy or rough (applies to PC4200 models).	One or more wheels are worn.	► Check the hole through each wheel for wear. If a wheel is out-of-round, replace the wheel or the wheel assembly.
	The drive rod is loose or disconnected.	► Check the connections of the drive rod to the drive plate on the storage frame, and to the crank block on the motor. Secure the connections if necessary.
	A bearing on the drive rod assembly is grinding or worn.	► On the drive rod assembly, check the bearing on the end connected to the drive plate. Lubricate the bearing by injecting grease through the fitting on it. If the bearing is worn, replace the drive rod assembly.
Agitation is noisy or rough (applies to PC4200 models).	The crank block on the motor is worn.	► Check the crank block on the motor for wear. Replace the crank block if it is worn.
	The motor is faulty.	► Replace the motor.
Agitation of installed agitators is noisy or rough (applies to all models except PC4200 models).	One or more feet on the incubator are worn (applies to countertop model incubators).	► Check the feet for wear. Replace feet if necessary.
	On the agitator, a component is faulty or internal connections are loose.	► See the Agitator Service Manual for information on how to proceed.

4.2 Chamber temperature problems

Problem	Possible Cause	Action
The chamber temperature displayed is higher or lower than the actual temperature (i.Series models)	The monitor is not calibrated.	► Confirm the upper temperature probe is reading correctly. Calibrate the probe if necessary. See Operation manual.
	Digital electronics are locked because of an interruption in power.	► Reset the monitoring system.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The chamber temperature does not stabilize at the incubator setpoint.	The condenser grill is dirty.	► Check the condenser grill. Clean it if necessary.
	The circulation at the top of the chamber is not adequate.	► Check if there are any items that may obstruct air flow and remove them if necessary.
	The ambient air temperature around the incubator is too high.	► Confirm the incubator is placed appropriately.
	The refrigerant level is too low.	► Contact a qualified service technician.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.

4.3 Alarm activation problems

Problem	Possible Cause	Action
The incubator is in an alarm condition, but alarms are not audible.	Audible alarms have been muted.	► Verify that audible alarms are not muted. For i.Series models, if the time remaining on the MUTE timer is greater than 5 minutes, change the MUTE timer value to 5 minutes and wait until the timer resets.
	Audible alarms have been disabled (Horizon Series models).	► Verify that audible alarms are not disabled.
	The volume is set too low.	► Check the volume and change it if necessary. See Appendix A.
	The alarm is not communicated audibly, visually or through the remote alarm interface.	► Verify whether the active alarm should be communicated audibly. See Appendix D.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
All alarms are activating sporadically.	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The No Battery alarm is activating sporadically (i.Series models).	The battery voltage level on the backup batteries for the monitoring system is low.	► Replace the backup batteries for the monitoring system.

Problem	Possible Cause	Action
The incubator meets a high or low temperature alarm condition, but the appropriate alarm is not active.	The alarm setpoint was changed.	► Check the current setpoints for the alarms. Change the setpoints if necessary.
	The end of the delay period for the alarm has not been reached (Horizon Series models)	► Wait until the delay period has ended. The alarm should activate. See Appendix B.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
There is an active temperature alarm, but the incubator does not meet a high or low temperature condition.	The monitor is not calibrated (i.Series models).	► Confirm the upper temperature probe is reading within the appropriate tolerance for your organization. Calibrate the probe if necessary.
A high or low temperature alarm activated, but the temperature recorded at activation does not match the alarm setpoint.	The monitor is not calibrated (i.Series models).	► Confirm the upper temperature probe is reading within the appropriate tolerance for your organization. Calibrate the probe if necessary.
	The temperature changed slightly around the time of activation.	► No action needed.
The incubator is not receiving AC power, but the power failure alarm is not active.	The alarm setpoint was changed (i.Series models).	► Check the current setpoints for the alarms. Change the setpoints if necessary. See Appendix A.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The condenser alarm is active (i.Series models).	The compressor is overheating due to lack of airflow.	► Check the condenser grill. Clean it if necessary. ► Confirm the incubator is placed appropriately.
	The condenser alarm setpoint is too low.	► Confirm the alarm setpoint is set at the appropriate value. See Appendix A.
	The refrigerant level is too low.	► Contact a qualified service technician.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
	The condenser probe is not calibrated.	► Contact a qualified service technician.

Problem	Possible Cause	Action
The incubator is connected to power, but the AC Power Failure alarm is active.	The circuit breakers have tripped or are not seated correctly (all floor models that are 115 V, and all countertop models).	► Confirm the circuit breakers are seated. Push the circuit breakers to reset them if necessary. If the breakers cannot be reset, or they trip again, contact a qualified service technician. (**NOTE**: 115 V countertop models have one circuit breaker.)
	The fuses have blown (all floor models that are 230 V).	► Contact a qualified service technician.
	There is no AC power to the incubator.	► Verify the power cord is connected securely to the incubator and the outlet. Tighten the connections if necessary. ► Verify the outlet is operational and meets the power requirements for the incubator. Repair the original outlet or connect to a different outlet if necessary.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The Door Open alarm is activating sporadically (i.Series models).	The Door Ajar Timeout is set to zero, causing the alarm to activate immediately when the door is opened (i.Series models)	► Check the current setpoint for the Door Ajar alarm. Change the setpoint if necessary. See Appendix A.
	The doors are not closing completely.	► Confirm the doors are aligned. Contact a qualified service technician if necessary.
	The doors are closing but not sealing completely.	► Confirm the door gasket seals completely. Contact a qualified service technician if necessary.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The motion alarm is active, but the agitator is moving.	A Horizon Series agitator is installed, but the alarm for the corresponding position was not disabled.	► Disable the motion alarm for that position. See Appendix A.
	The i.Center monitoring system is not receiving motion information from the agitator (i.Series models without a built-in agitator).	► On the incubator's monitoring system, check whether agitator information is being received. See Appendix A. ► Verify the I/O cable is connected securely to the agitator and the corresponding port in the incubator. Tighten the connections if necessary.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.

Problem	Possible Cause	Action
Agitation has stopped, but the motion alarm is not active.	The motion alarm for the position where the agitator is installed has been disabled (i.Series models).	► Enable the motion alarm. See Appendix A.
	The agitator alarm setpoint value has not been reached (i.Series models)	► Wait until the setpoint has been reached. The alarm should activate. See Appendix A.
	The delay period for the motion alarm is set too low (PC4200i models)	► Verify the delay period control is set to a value greater than the agitator alarm setpoint. See Appendix A.
	The end of the delay period for the motion alarm has not been reached (Horizon models)	► Wait until the delay period has ended. The alarm should activate. For more information on this topic for PC4200 models, See Appendix B. For information on the delay period on installed i.Series agitators, see the Agitator Operation Manual.
	The motion alarm system is not receiving power.	► Check that there is AC power to the incubator. ► Test the backup battery. If the battery is not functioning, replace the battery.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The motion alarm is activating sporadically while the agitator is moving.	The alarm system is not receiving power consistently (PC4200 models).	► Check that there is AC power to the agitator. ► Test the backup battery. If the battery is not functioning, or has been in use for one year, replace the battery.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The motion alarm is active, but there is no agitator installed at that position (i.Series models without a built-in agitator).	The alarm is enabled for that position when it should be disabled.	► Disable the motion alarm for that position. See Appendix A.
The motion alarm is activating immediately when agitation is started (PC4200h models).	The delay period is set to 0 minutes, which activates the alarm before motion can be sensed.	► Change the delay period to a value greater than 0 minutes. For instructions, see Appendix B.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.

Problem	Possible Cause	Action
The incubator is in an alarm condition, and the time delay has elapsed, but alarms are not audible.	The connection between the alarm board and alarm buzzer is loose or a part is faulty (applies to Horizon Series models)	► Check the connections between the alarm board and the alarm buzzer. Secure the connections if necessary. While the incubator is in the alarm condition and after the delay has elapsed, check for a low voltage of approximately 4 V dc at connector J4 on the alarm board. Replace the alarm buzzer or alarm board if necessary.
	The connection between the alarm board and the motion alarm buzzer is loose or a part is faulty (applies to PC4200h models).	► Check the connections between the alarm board, agitator board, and alarm buzzer. Secure the connections if necessary. Replace the alarm board, agitator board, or motion alarm buzzer if necessary.
	The connection between the control board and the alarm buzzer is loose or a part is faulty (applies to i.Series models).	► Check the connections between the control board and the alarm buzzer. Secure the connections if necessary. While the incubator is in the alarm condition and after the delay has elapsed, check for a variable (switching) DC voltage at connector J8 on the control board. Replace the control buzzer if necessary. Replace parts with those that are included in the control and display board kit if necessary.
All alarms are activating sporadically.	The alarm board is faulty (applies to Horizon Series models).	► Confirm the alarm board and line connections are functioning correctly. Replace the alarm board if necessary.
	The control board is faulty (applies to i.Series models).	► Confirm the control board and line connections are functioning correctly. Replace parts with those that are included in the control and display board kit if necessary.
The main power switch is on and the incubator is receiving power, but the AC Power Failure alarm is active.	The connection between the terminal board and the alarm board is loose or a board is faulty (applies to Horizon Series models).	► Check the connection between the terminal board and alarm board. Confirm the terminal board is supplying power to the alarm board. Secure the connections if necessary. Replace the terminal board or alarm board if necessary.
	The connection between the terminal board and the control board is loose or a board is faulty (applies to i.Series models).	► Check the connections between the terminal board, power supply board, and control board. Confirm the terminal board is supplying power to the power supply board, and the power supply board is supplying power to the control board. Secure the connections if necessary. Replace the terminal board or power supply board if necessary. Replace parts with those that are included in the control and display board kit if necessary.

Problem	Possible Cause	Action
The incubator is not receiving AC power, but the power failure alarm is not active.	The power failure alarm backup battery is depleted (applies to Horizon Series models).	► Verify the key switch is set to enable the audible power failure alarm. Replace the backup battery if necessary.
	The connection between the alarm board and alarm buzzer is loose or a part is faulty (applies to Horizon Series models)	► Verify the key switch is set to enable the audible power failure alarm. Check the connections between the alarm board and the alarm buzzer. Secure the connections if necessary. While the incubator is in the alarm condition and after the delay has elapsed: check for a low voltage of approximately 4 V dc at connector J4 on the alarm board. Replace the alarm buzzer or alarm board if necessary.
	The i.Center monitoring system backup battery is depleted or disabled (applies to i.Series models).	► Verify the key switch is set to enable the battery. Replace the backup battery if necessary.
	The connection between the terminal board and the control board is loose or a board is faulty (applies to i.Series models)	► Check the connections between the terminal board and the control board. Secure the connections if necessary. Replace the terminal board if necessary. Replace parts with those that are included in the control and display board kit if necessary.
The incubator meets a high or low temperature alarm condition, but the appropriate alarm is not active.	The alarm board is faulty (applies to Horizon Series models).	► Confirm the alarm board and line connections are functioning correctly. Replace the alarm board if necessary.
	The control board is faulty (applies to i.Series models).	► Confirm the control board and line connections are functioning correctly. Replace parts with those that are included in the control and display board kit if necessary.
The condenser alarm is active (applies to i.Series models).	The refrigerant level is too low.	► Check the refrigeration lines for leaks and repair them if necessary. Check the refrigerant pressure and recharge the refrigerant if necessary.
	The connections between the condenser temperature probe and the control board are loose or a part is faulty.	► Test the probe connections. Secure the connections if necessary. Confirm the probe is working correctly: it should provide a resistance in the range of 95 Ω to 120 Ω. Replace the probe if necessary. Replace parts with those that are included in the control and display board kit if necessary.
	The condenser probe is not calibrated.	► Confirm the condenser probe is reading correctly. Calibrate the probe if necessary.
	The condensing unit fan is not running.	► Check the compressor/condensing unit connections. Replace the compressor/condensing unit if necessary.

Problem	Possible Cause	Action
The condenser alarm is active (applies to i.Series models).	The temperature of the condensing unit is occasionally reaching 50 °C during normal operation (applies to PC100i, PC900i, and PC1200i models).	► Change the condenser alarm setpoint to 55 °C (applies to PC100i, PC900i, and PC1200i models).
The Door Open alarm is activating sporadically (applies to i.Series models).	The door(s) are not closing and sealing completely (applies to PC100 and floor models).	► Confirm the door gasket seals completely. Confirm the hinge cams (floor models) or hinge bearings (PC100 models) are not damaged. Replace the door gasket, hinge cams, or hinge bearings if necessary.
	The hood is not closing and sealing completely (applies to PC900 and PC1200 models).	► Confirm the door gasket seals completely. Confirm the damping cylinder is not damaged. Replace the damping cylinder or hood assembly if necessary. ► On the chamber wall in the hinge area, check the Nutsert for looseness. Replace the Nutsert if necessary.
	The connections between the door switches and the terminal board are loose or a part is faulty.	► Check the connections from the door switches to the terminal board. For floor models, check the connections with and the condition of the terminal strip. Secure the connections if necessary. ► (115 V floor models only) Confirm the secondary circuit breaker has not tripped. Push the circuit breaker to reset it if necessary. ► Confirm the terminal board is supplying power to the door switch or switches. Replace the terminal board, circuit breaker, or one or both door switches if necessary.
	The connection between the terminal board and the control board is loose or a board is faulty.	► Check the connections between the terminal board and the control board. Secure the connections if necessary. Replace the terminal board if necessary. Replace parts with those that are included in the control and display board kit if necessary.
Agitation has stopped, but the motion alarm is not active on the incubator's i.Center monitoring system (applies to Helmer i.Series agitators installed in i.Series incubators).	The connection between the agitator and the incubator is loose or a part is faulty.	► Check the connections from the agitator through the I/O cable and agitator board to the terminal board. Secure the connections if necessary. Replace the I/O cable, agitator port board, or terminal board if necessary.
	The connection between the terminal board and the control board is loose or a board is faulty.	► Check the connections between the terminal board and the control board. Secure the connections if necessary. Replace the terminal board if necessary. Replace parts with those that are included in the control and display board kit if necessary.
	On the agitator, a component is faulty or internal connections are loose.	► See the Agitator Service Manual for information on how to proceed.

Problem	Possible Cause	Action
Agitation has stopped, but the motion alarm is not activating after the time delay has elapsed (applies to PC4200 models).	The proximity sensor and/or proximity actuator connections are loose, or a part is misaligned or faulty.	► Check the connections from the proximity sensor through the agitator board to the terminal board. Secure the connections if necessary. Replace the proximity sensor, terminal board, or agitator board if necessary. ► Check the positions of the actuator and the sensor. They should be aligned and be separated by a gap of approximately 0.125 in (3 mm). Adjust the position of the sensor if necessary. Replace the proximity sensor or proximity actuator if necessary.
	The connection between the alarm board and the motion alarm buzzer is loose or a part is faulty (applies to PC4200h models).	► When the alarm is supposed to activate, check if the alarm buzzer sounds. Check the connections from the alarm board through the agitator board to the alarm buzzer. Secure the connections if necessary. Replace the alarm board, agitator board, or motion alarm buzzer if necessary.
The motion alarm is activating sporadically while the agitator is moving (applies to PC4200 models only).	The proximity sensor and/or proximity actuator connections are loose, or a part is misaligned or faulty.	► Check the connections from the proximity sensor through the agitator board to the terminal board. Secure the connections if necessary. Replace the proximity sensor, terminal board, or agitator board if necessary. ► Check the positions of the actuator and the sensor. They should be aligned and be separated by a gap of approximately 0.125 in (3 mm). Adjust the position of the sensor if necessary. Replace the proximity sensor or proximity actuator if necessary.
	The connection between the alarm board and the motion alarm buzzer is loose or a part is faulty (applies to PC4200h models).	► When the alarm is supposed to activate, check if the alarm buzzer sounds. Check the connections from the alarm board through the agitator board to the alarm buzzer. Secure the connections if necessary. Replace the alarm board, agitator board, or motion alarm buzzer if necessary.
The motion alarm is activating immediately when agitation is started (applies to PC4200h models).	The alarm delay control is faulty.	► Change the delay period to a value greater than 0 minutes. Verify the alarm activates after a delay. If it still activates immediately, replace the motion alarm control board.

Problem	Possible Cause	Action
Helmer i.Series agitators are agitating in the incubator, but the motion alarm is activating (applies to all i.Series models except PC4200i models).	The connection between the agitator and the incubator is loose or a part is faulty.	► Check the connections from the agitator through the I/O cable and agitator board to the terminal board. Secure the connections if necessary. Replace the I/O cable, agitator port board, or terminal board if necessary.
	On the i.Center, unused agitator positions have not been disabled (applies to PC2200i and PC3200i models).	► Check the agitator alarm settings for the unused positions. See Appendix A.
	On the agitator, a component is faulty or internal connections are loose.	► See the Agitator Service Manual for information on how to proceed.

4.4 Testing problems

Problem	Possible Cause	Action
The automatic temperature tests do not work (i.Series models).	The High Alarm setpoint is set significantly higher than the default value, or the Low Alarm setpoint is set significantly lower than the default value.	► Confirm the alarm setpoints are set at the appropriate values. See Appendix A. ► Test the temperature alarms manually.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
The automatic temperature tests do not work (applies to i.Series models).	The connections between the upper chamber temperature probe and the control board are loose or a part is faulty.	► Test the probe connections. Secure the connections if necessary. Replace the probe if necessary. Replace parts with those that are included in the control and display board kit if necessary.

4.5 Condensation problems

Problem	Possible Cause	Action
There is excessive water in the water evaporation tray.	Humid air is entering the chamber.	► Confirm the incubator is level, and the doors are aligned, closing tightly, and sealing correctly. Contact a qualified service technician to correct issues as necessary.
	The heater in the evaporation tray is faulty.	► Confirm the heater is hot. Contact a qualified service technician to confirm the heater is drawing the appropriate current.
There is excessive water in the chamber.	Humid air is entering the chamber.	► Confirm the incubator is level, and the doors are aligned, closing tightly, and sealing correctly. Contact a qualified service technician to correct issues as necessary.
There is excessive humidity on the doors.	Humid air is entering the chamber.	► Confirm the incubator is level, and the doors are aligned, closing tightly, and sealing correctly. Contact a qualified service technician to correct issues as necessary.
	The relative humidity around the incubator is too high.	► Confirm the incubator is placed appropriately.
There is excessive water in the water evaporation tray (applies to countertop models).	The connections between the terminal board and the condensate evaporator in the tray are loose or a part is faulty.	► Check the connections between the terminal board and the condensate evaporator (heater). Secure the connections if necessary. ► Confirm the condensate evaporator is working correctly. It should be hot and drawing the appropriate current: ► For 115 V models, the current should be approximately 0.43 A to 0.55 A ► For 230 V models, the current should be approximately 0.21 A to 0.35 A ► Replace the condensate evaporator or terminal board if necessary.

4.6 Resetting the i.Center monitoring system

NOTE: This section and the next apply to i.Series models.

1. From the battery backup system, remove one battery.
2. Disconnect the incubator from AC power.
3. Reconnect the incubator to power.
4. Replace the battery.

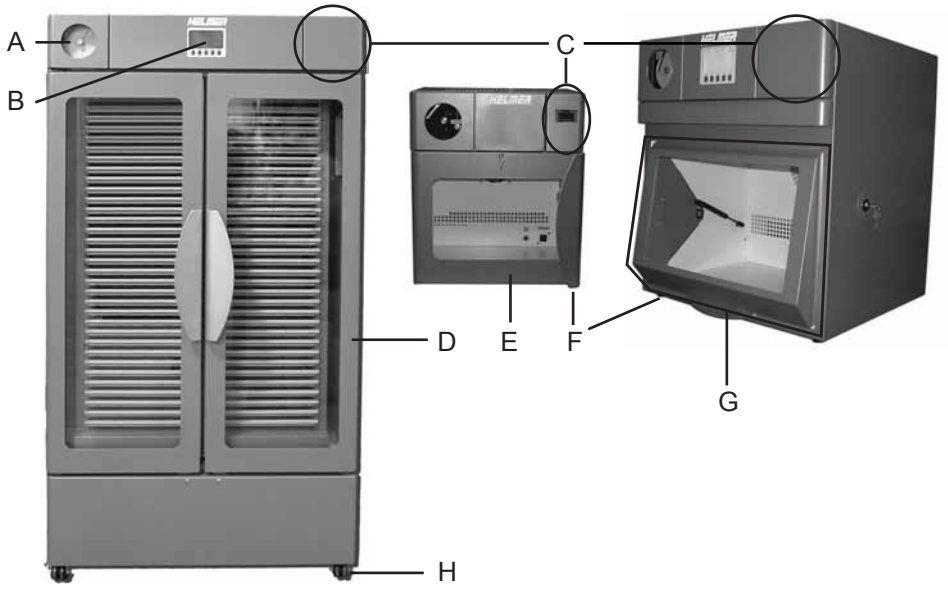
4.7 Viewing manufacturer and product information

1. From the MAIN screen, select Product/Company Information. The Helmer logo appears, followed by the INFORMATION screen, displaying the Control Version and the Display Version.
2. Press the NEXT button. The manufacturer information displays.

5 Parts

See Section 7 for incubator schematics.

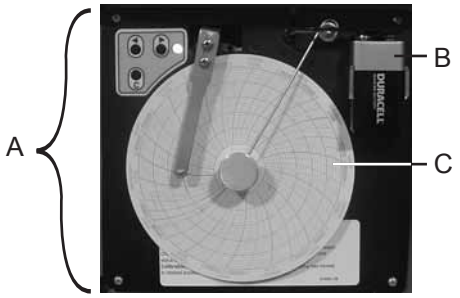
5.1 Parts on the front



Left: Sample floor model (PC4200i model). Middle: Sample countertop model (PC100h model). Right: Sample countertop model with hood-style door (PC900i model).

Label	Description	Replacement part numbers
A	Chart recorder	See Section 5.1.1.
B	i.Center (monitoring system)	i.Series models. See Section 5.1.2.
C	Control door area	See Section 5.1.3.
D	Door	See Section 5.1.4.3.
E	Door	PC100 models. See Section 5.1.4.1.
F	Foot	Countertop models: 220432
G	Hood	PC900 and PC1200 models. See Section 5.4.1.2.
H	Caster (swivel with brake)	Floor models: 220261

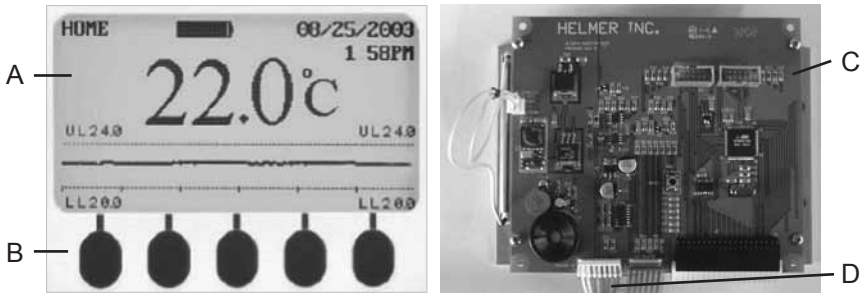
5.1.1 Temperature chart recorder parts



Temperature chart recorder

Label	Description	Replacement part numbers	Label on schematic
A	Temperature chart recorder	400409-4 (includes manual and battery)	X
B	Chart recorder backup battery (9 V alkaline, non-rechargeable)	120218	AD
C	Chart paper	220273 (package of 52 sheets)	-

5.1.2 i.Center display parts (i.Series models only)

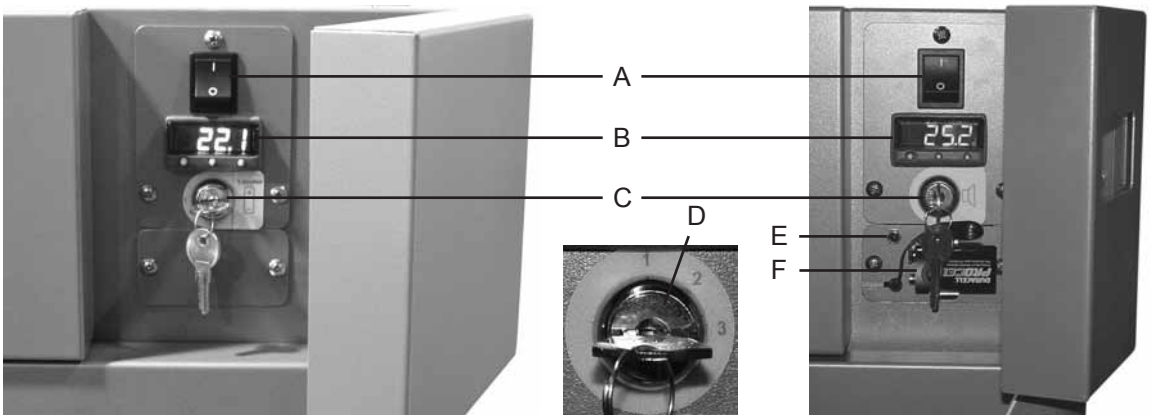


Left: Front view of display assembly showing LCD board and touchpad. Right: Rear view showing display board

Label	Description	Replacement part numbers	Label on schematic
A	LCD board (see note below)	120452	K
B	Touchpad (see note below)	320722-1	K
C	Display board	Included in the control and display board kit.	K
D	Interface cable	PC100i models: 400502-3 All other i.Series models: 400502-2	AA
Not shown	Display assembly	Includes LCD board and touchpad 400509-1	K

NOTE: Although the LCD board and touchpad may be replaced individually, Helmer recommends replacing the display assembly.

5.1.3 Control door area parts

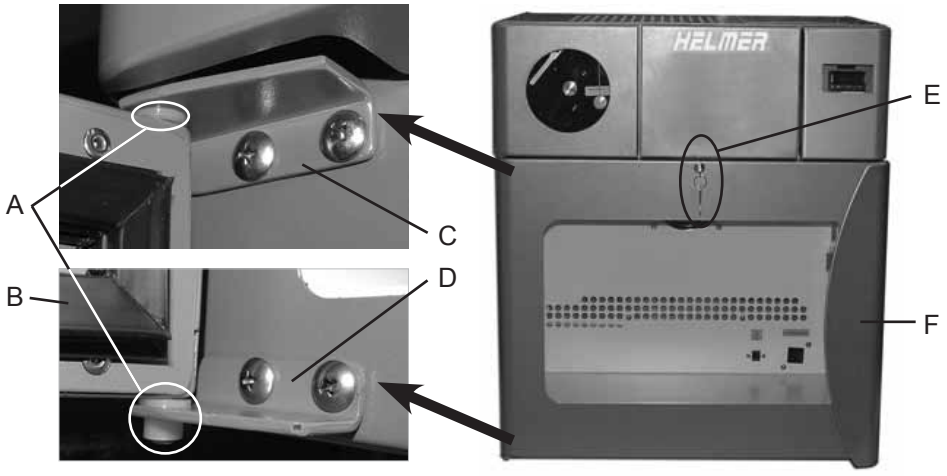


Left: Controls for i.Series models (PC2200i model). Center: Key switch for PC4200h models. Right: Controls for Horizon Series models (PC100h model).

Label	Description	Replacement part numbers	Label on schematic
A	Main power switch	120478	Q
B	Temperature controller (programmed)	Countertop models: 400600-1 Floor models: 400601-1	B
C	Key switch, 2-way	All models except PC4200h: 120227	W
D	Key switch, 3-way	PC4200h models only: 120489	AI
E	Mute button	Horizon Series models: 120197	AF
F	Battery for power failure alarm (9 V alkaline, non-rechargeable)	Horizon Series models: 120218	AH

5.1.4 Door and hinge parts

5.1.4.1 Door and hinge parts for PC100 models



Left: Detail of hinges on PC100 models. Right: Sample PC100 model (PC100h model).

Label	Description	Replacement part numbers
A	Hinge bearing	220295
B	Door seal kit	400785-1
C	Upper hinge bracket	320846-1
D	Lower hinge bracket	320846-2
E	Door lock	220374
F	Door handle	320865-1

5.1.4.2 Hood parts for PC900 and PC1200 models

Hood parts on PC900 and PC1200 models (PC900i model).

Label	Description	Replacement part numbers
A	Hood assembly	Excludes damping cylinder and door lock PC900 models: 400626-1 PC1200 models: 400626-2
B	Damping cylinder	220210
C	Hood lock	220272
Not shown	Hood seal kit	PC900 models: 400786-1 PC1200 models: 400786-2

5.1.4.3 Door and hinge parts for floor models

Left: Detail of door brush seal. Middle: Sample floor model (PC4200i). Right: Hinge detail.

Label	Description	Replacement part numbers
A	Door brush seal	PC2200 models: 320920-2 PC3200 and PC4200 models: 320920-1
B	Door handle	320865-1
C	Door lock	220374
D	Upper hinge bracket	Left hinge: 400647-2. Right hinge: 400647-1
E	Door seal kit	PC2200 models: 400787-1 PC3200 and PC4200 models: 400788-1
F	Hinge cam	320742-1
G	Lower hinge bracket	Left hinge: 400647-1. Right hinge: 400647-2

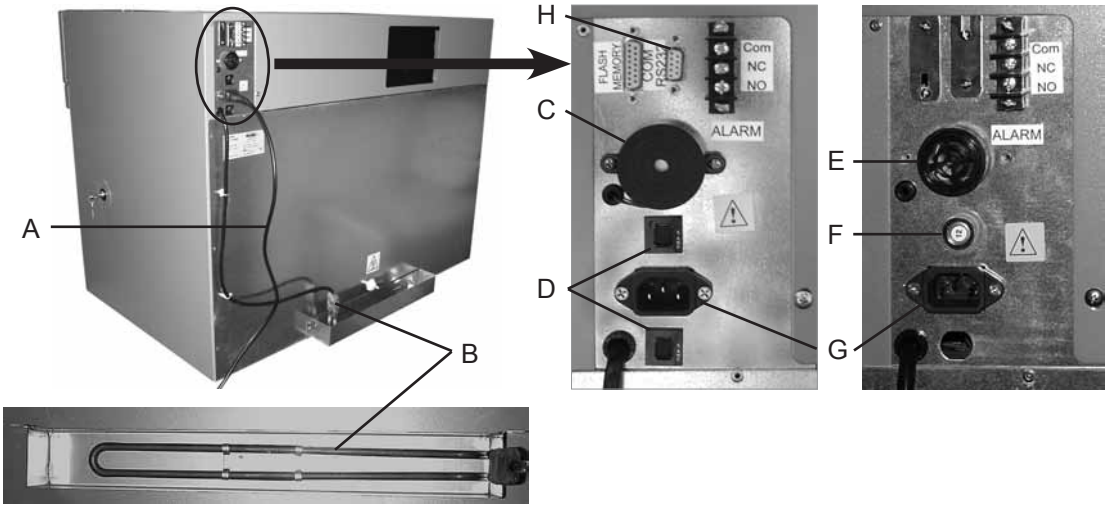
5.2 Parts on the top

Top view (PC100 model)

Label	Description	Function
A	Service cover	Covers components on top of the incubator
B	Access panel	Provides access to components used for configuring alarms and providing backup power.

5.3 Parts on the rear

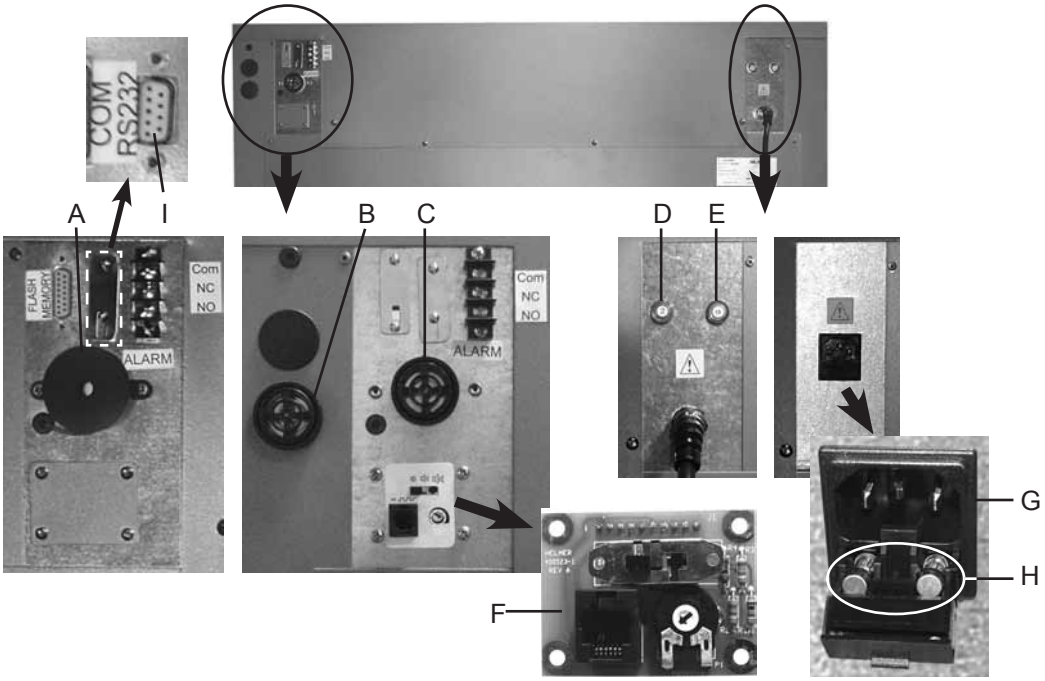
5.3.1 PC100, PC900, and PC1200 models



Top left: Sample countertop model (PC1200h 230 V model). Bottom left: Detail of condensate evaporator. Middle: Sample alarm area for i.Series model (PC1200i 230 V model). Right: Sample alarm area for Horizon Series model (PC100h 115 V model).

Label	Description	Replacement part numbers	Label on schematic
A	Power cord	115 V models: 120271 230 V models: 120156	-
B	Condensate evaporator kit	Includes tray 115 V models: 400791-1 230 V models: 400791-2	J
C	Alarm buzzer	i.Series models: 120457	D
D	Circuit breaker, 6 A	230 V models: 120288	P
E	Alarm buzzer	Horizon Series models: 120160	D
F	Circuit breaker, 12 A	115 V models: 120220	P
G	Power connector with power line filter	120299	AK
H	RS232 port	Optional feature for i.Series models: 400705-2	AQ

5.3.2 PC2200, PC3200, and PC4200 models

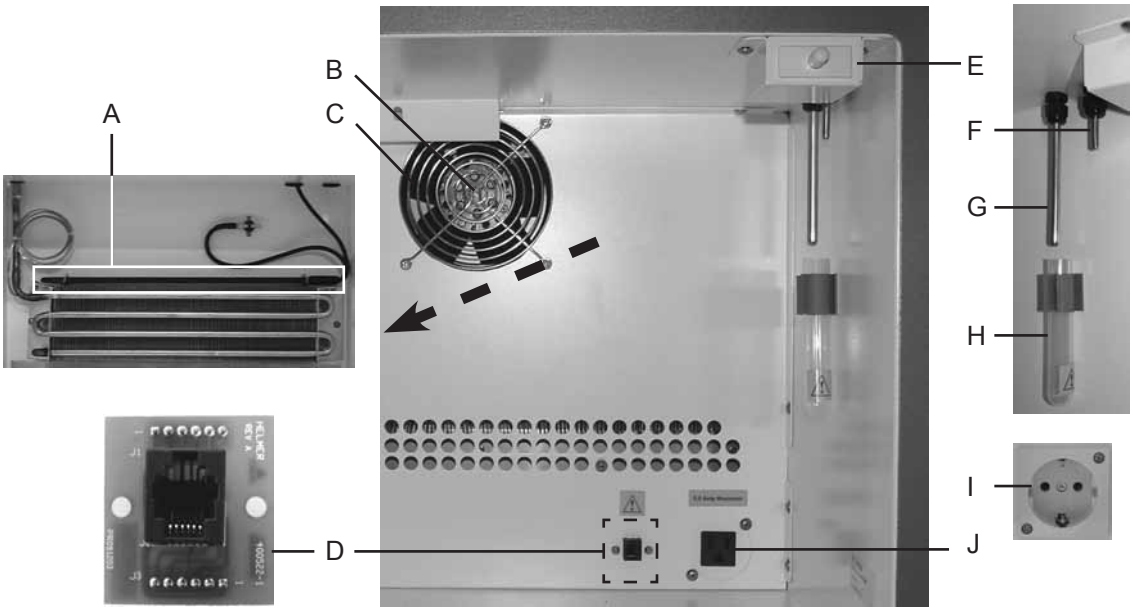


Top: Sample floor model (PC3200h 115 V model). Bottom: Details of various models.

Label	Description	Replacement part numbers	Label on schematic
A	Alarm buzzer	i.Series models: 120457	D
B	Motion alarm buzzer	PC4200h models: 120160	AG
C	Alarm buzzer	Horizon Series models: 120160	D
D	Circuit breaker, secondary	PC2200 and PC3200 115 V models (2 A): 120252 PC4200 115 V models (5 A): 120514	AM
E	Circuit breaker, primary	PC2200 and PC3200 115 V models (15 A): 120259 PC4200 115 V models (20 A): 120191	P
F	Motion alarm control board	PC4200 models: 400523-1	V
G	Power connector with fuse holder	230 V models: 120379	U
H	Fuse, 10 A	230 V models: 120174	R
I	RS232 port	Optional feature for i.Series models: 400705-2	AQ
Not shown	Power cord	230 V models: 120156	-

5.4 Interior parts

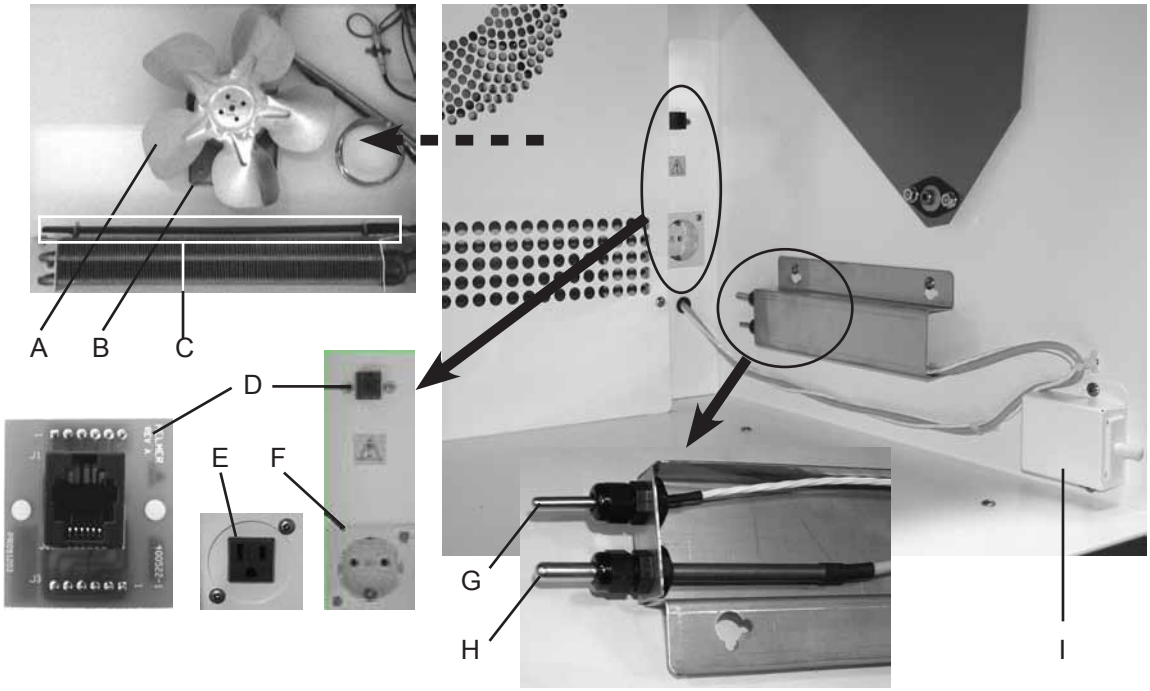
5.4.1 PC100 models



PC100 interior parts (PC100i model)

Label	Description	Replacement part numbers	Label on schematic
A	Chamber heater	115 V models: 120313 230 V models: 120314	C
B	Chamber fan guard	220122	-
C	Chamber fan	115 V models: 120009 230 V models: 120010	AL
D	Agitator port board	400522-1	AJ
E	Door switch	120490	I
F	Temperature control and chart recorder probe	120315	G
G	Temperature monitoring probe (upper chamber probe)	Includes connector i.Series models: 400510-1	AB
H	Tube for alarm checks	220299	-
I	Interior outlet, 230 V	230 V models: 120097	AO
J	Interior outlet, 115 V	115 V models: 120499	AN

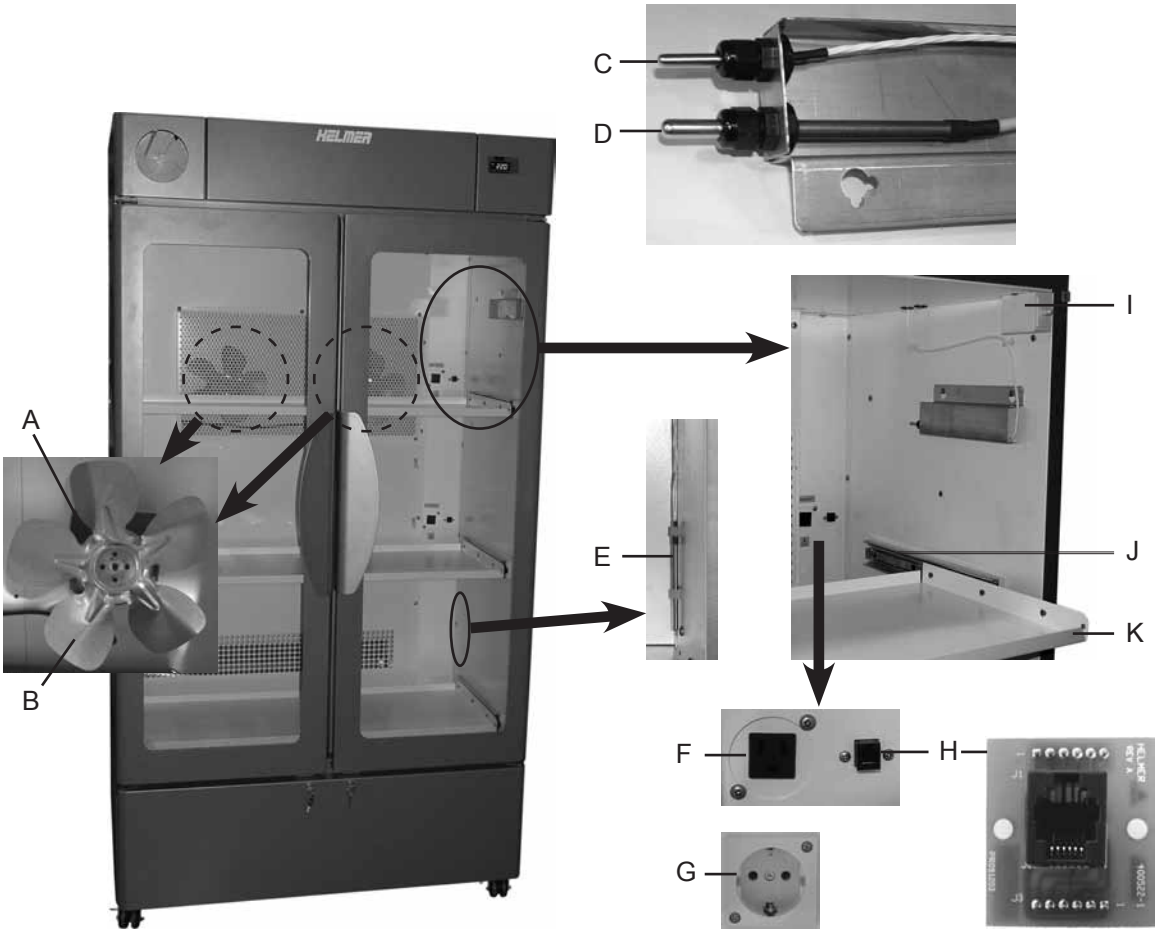
5.4.2 PC900 and PC1200 models



PC900 and PC1200 interior parts (PC900i 230 V model)

Label	Description	Replacement part numbers	Label on schematic
A	Chamber fan blade	220177	-
B	Chamber fan motor	115 V models: 120170 230 V models: 120171	AL
C	Chamber heater	115 V models: 120313 230 V models: 120314	C
D	Agitator port board	400522-1	AJ
E	Interior outlet, 115 V	115 V models: 120499	AN
F	Interior outlet, 230 V	230 V models: 120097	AO
G	Temperature control and chart recorder probe	120315	G
H	Temperature monitoring probe (upper chamber probe)	Includes connector i.Series models: 400510-1	AB
I	Door switch	120490	I

5.4.3 PC2200 and PC3200 models

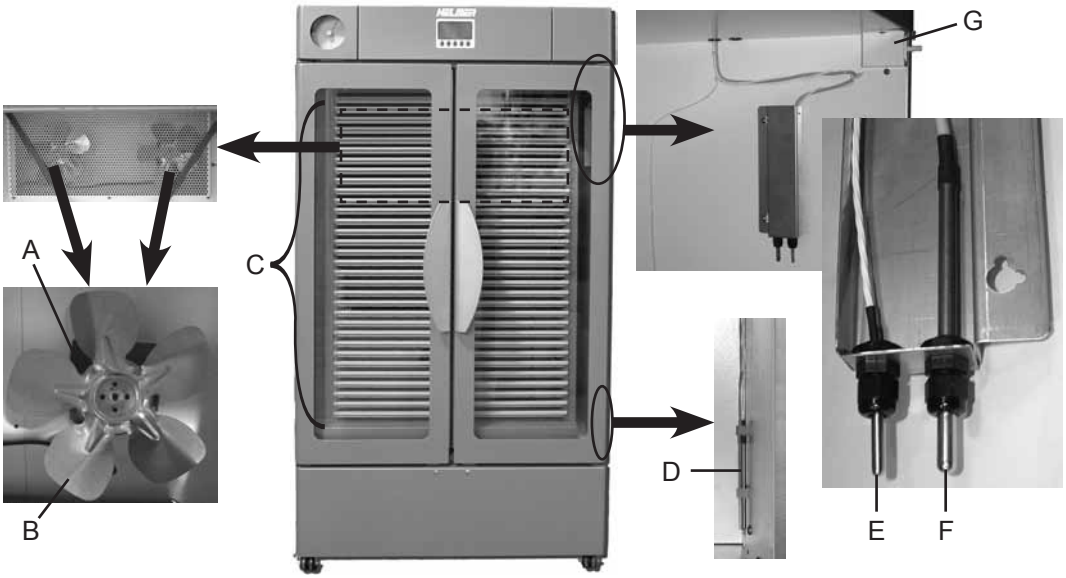


PC2200 and PC3200 interior parts (PC3200h 115 V model)

Label	Description	Replacement part numbers	Label on schematic
A	Chamber fan motor	115 V models: 120170 230 V models: 120171	AL
B	Chamber fan blade	220177	-
C	Temperature control and chart recorder probe	120315	G
D	Temperature monitoring probe (upper chamber probe)	Includes connector i.Series models: 400510-1	AB
E	Lower chamber probe	PC3200i models: 400513-1	N
F	Interior outlet, 115 V	115 V models: 120499	AN
G	Interior outlet, 230 V	230 V models: 120097	AO
H	Agitator port board	400522-1	AJ
I	Door switch	120490	I
J	Slide for roll-out shelf	400717-1	-
K	Roll-out shelf	Excludes bumpers and slides 320971-1	-

5.4.4 PC4200 models

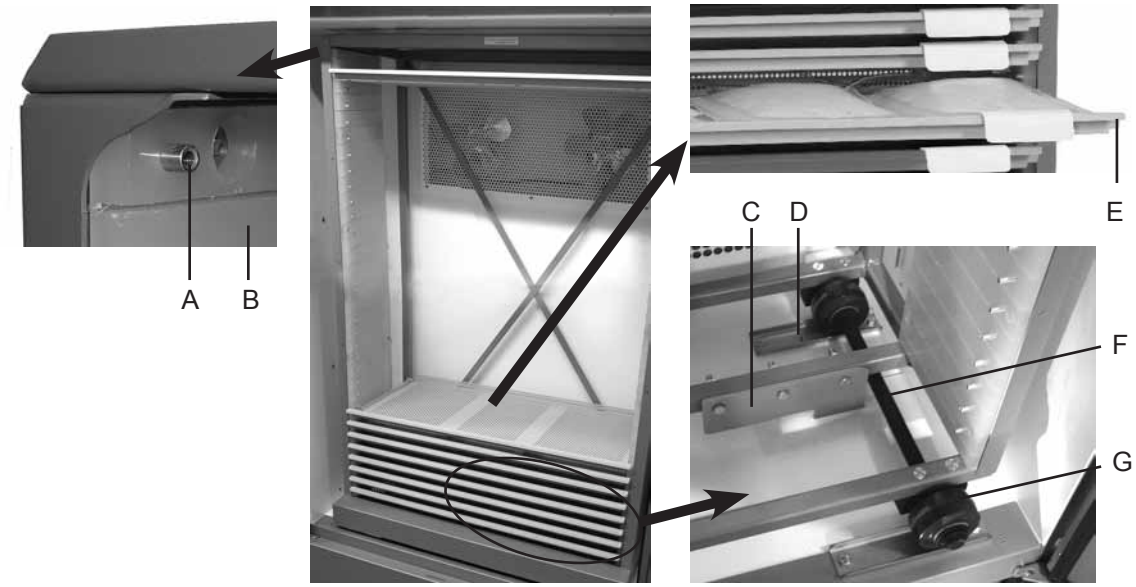
5.4.4.1 Chamber parts



PC4200 chamber parts (PC4200i model)

Label	Description	Replacement part numbers	Label on schematic
A	Chamber fan motor	115 V models: 120170 230 V models: 120171	AL
B	Chamber fan blade	220177	-
C	Built-in agitator	See Section 5.3.4.2.	-
D	Lower chamber probe	i.Series models: 400513-1	N
E	Temperature control and chart recorder probe	120315	G
F	Temperature monitoring probe (upper chamber probe)	Includes connector i.Series models: 400510-1	AB
G	Door switch	120490	I

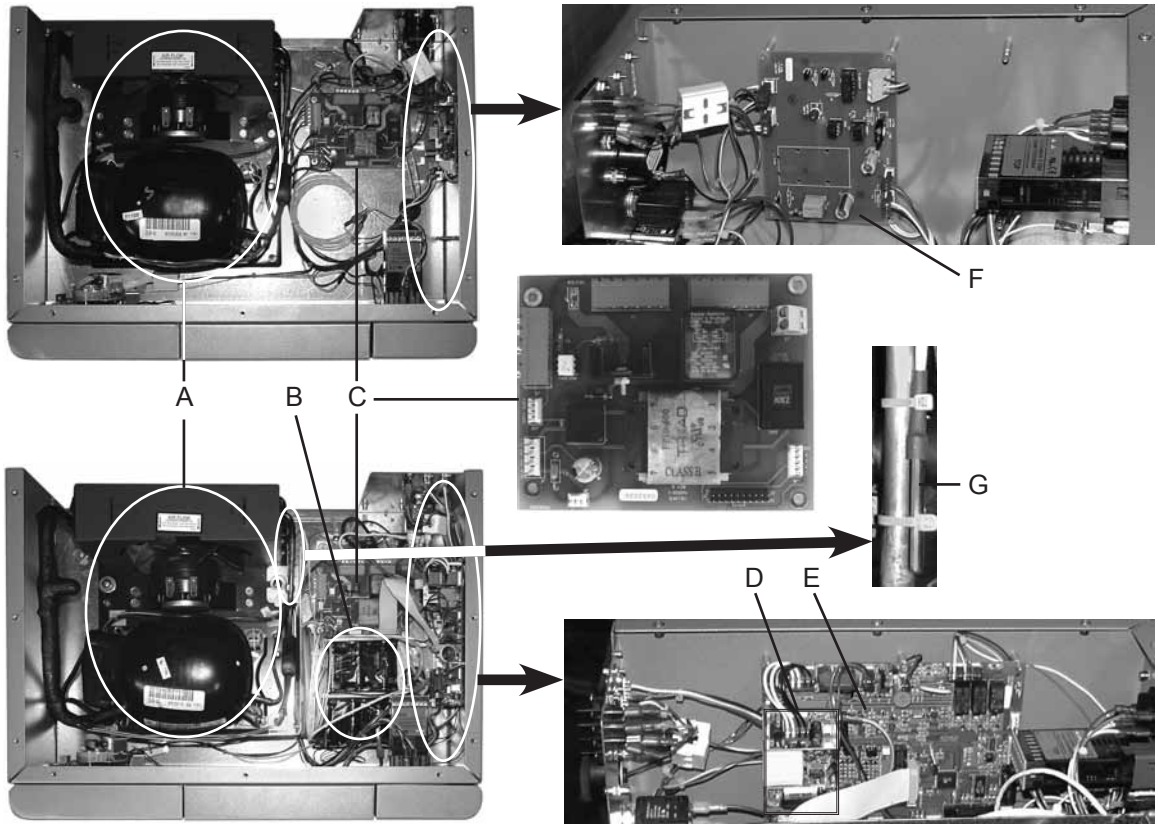
5.4.4.2 Built-in agitator parts



PC4200 built-in agitator parts (incubator with drawers removed)

Label	Description	Replacement part numbers
A	Drawer stop	400174-1
B	Drawer guide	Top left: 320540-1 Top right: 320540-2 Bottom left: 320541-1 Bottom right: 320541-2
C	Drive plate	321005-1
D	Wheel track	320215-1
E	Drawer assembly	Includes a label holder kit. Standard configuration is with a silver drawer. Silver drawer: 400616-1 Red drawer: 400617-1 Black drawer: 400615-1
F	Wheel assembly	Includes two wheels, axle, and mounting bracket. 400159-1
G	Wheel	320566-1 (part of the wheel assembly)

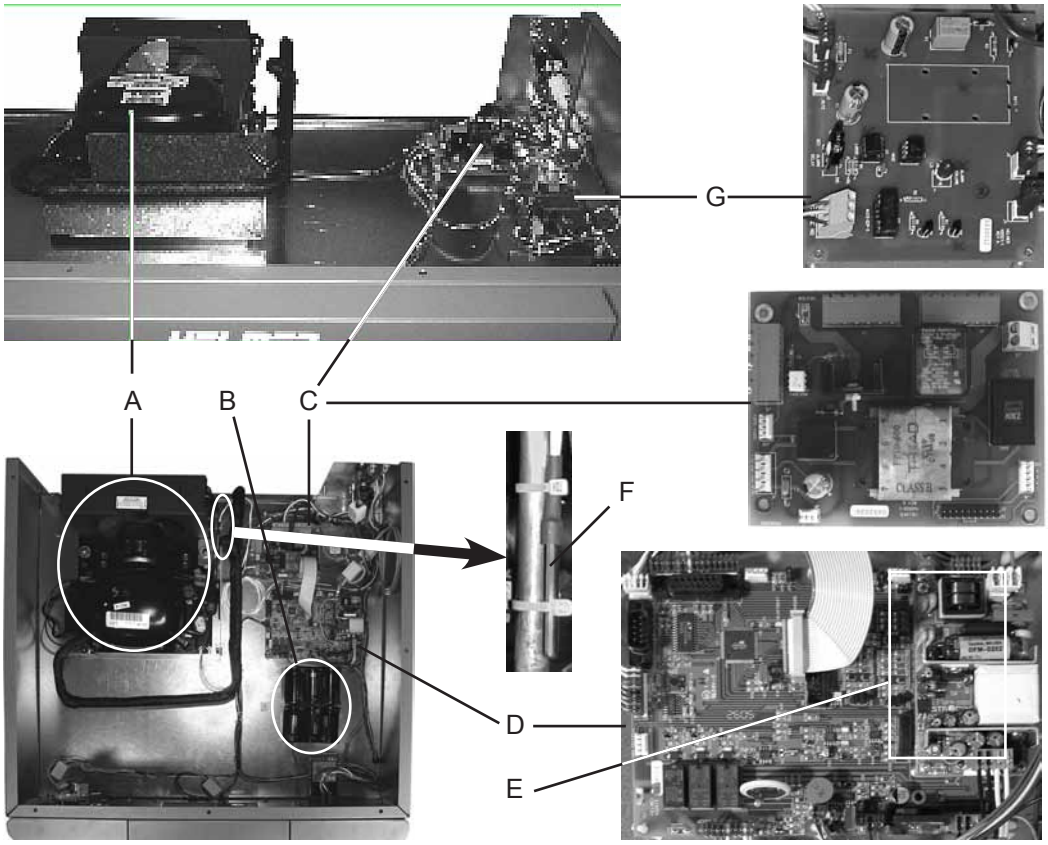
5.4.5 PC100 models



Top left: PC100h model. Top right: Detail of right wall of PC100h model.
Bottom left: PC100i model. Bottom right: Detail of right wall of PC100i model.

Label	Description	Replacement part numbers	Label on schematic
A	Compressor/condensing unit	115 V models: 400668-1 230 V models: 400668-2	A
B	Monitor backup battery (1.5 V D-cell alkaline, non-rechargeable)	i.Series models: 715031	AH
C	Terminal board	400520-1	F
D	Power supply board	i.Series models: 400633-1	Z
E	Control board	i.Series models only. Included in the control and display board kit.	E
F	Alarm board	Horizon Series models: 400521-1	L
G	Condenser probe	i.Series models: 400674-1	AC
Not shown	Starting relay coil for the compressor	115 V models: 120528 230 V models: 120523	AP
Not shown	Control and display board kit	i.Series models only. Includes the control board, display board, power supply board, and interface cable. 400650-1	K and E

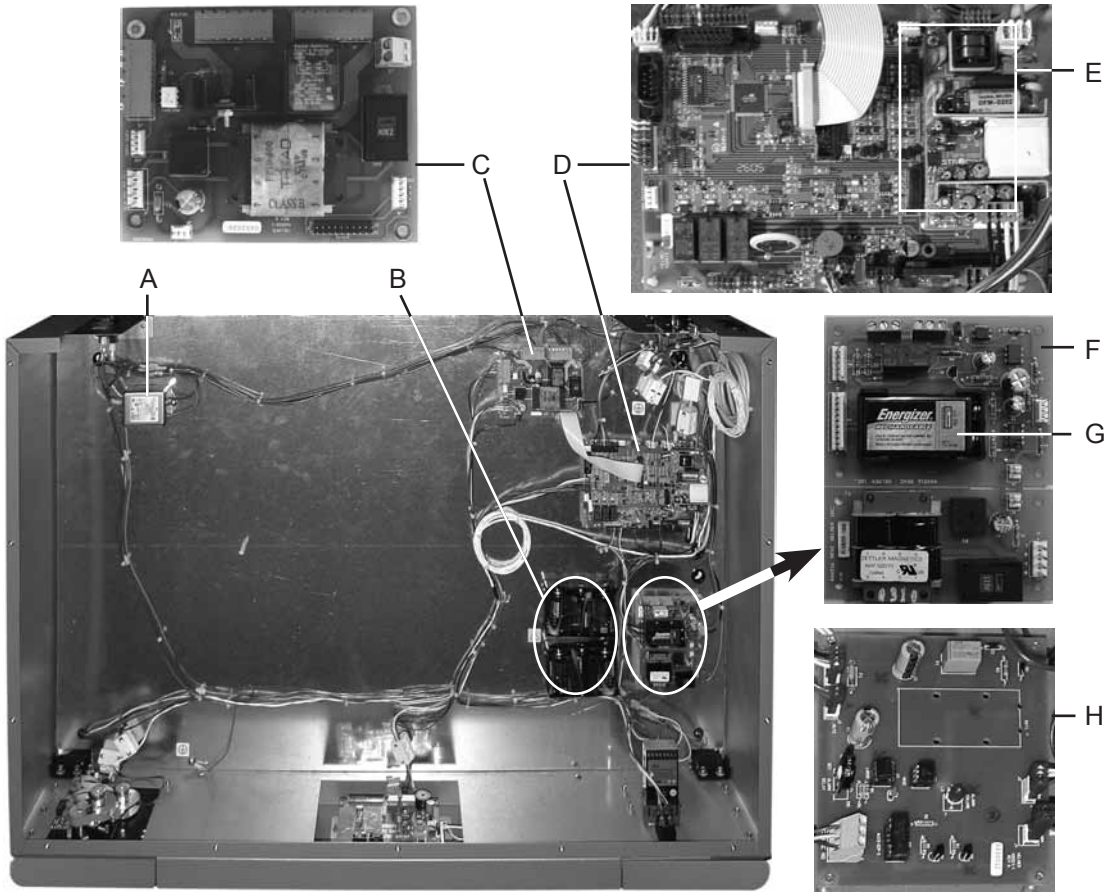
5.4.6 PC900 and PC1200 models



Top left: PC1200h model. Top right: Detail of alarm board.
Bottom left: PC900i model. Bottom right: Detail of control board and power supply board.

Label	Description	Replacement part numbers	Label on schematic
A	Compressor/condensing unit	115 V models: 400668-1 230 V models: 400668-2	A
B	Monitor backup battery (1.5 V D-cell alkaline, non-rechargeable)	i.Series models: 715031	AH
C	Terminal board	400520-1	F
D	Control board	i.Series models only. Included in the control and display board kit.	E
E	Power supply board	i.Series models: 400633-1	Z
F	Condenser probe	i.Series models: 400674-1	AC
G	Alarm board	Horizon Series models: 400521-1	L
Not shown	Starting relay coil for the compressor	115 V models: 120528 230 V models: 120523	AP
Not shown	Control and display board kit	i.Series models only. Includes the control board, display board, power supply board, and interface cable. 400650-1	K and E

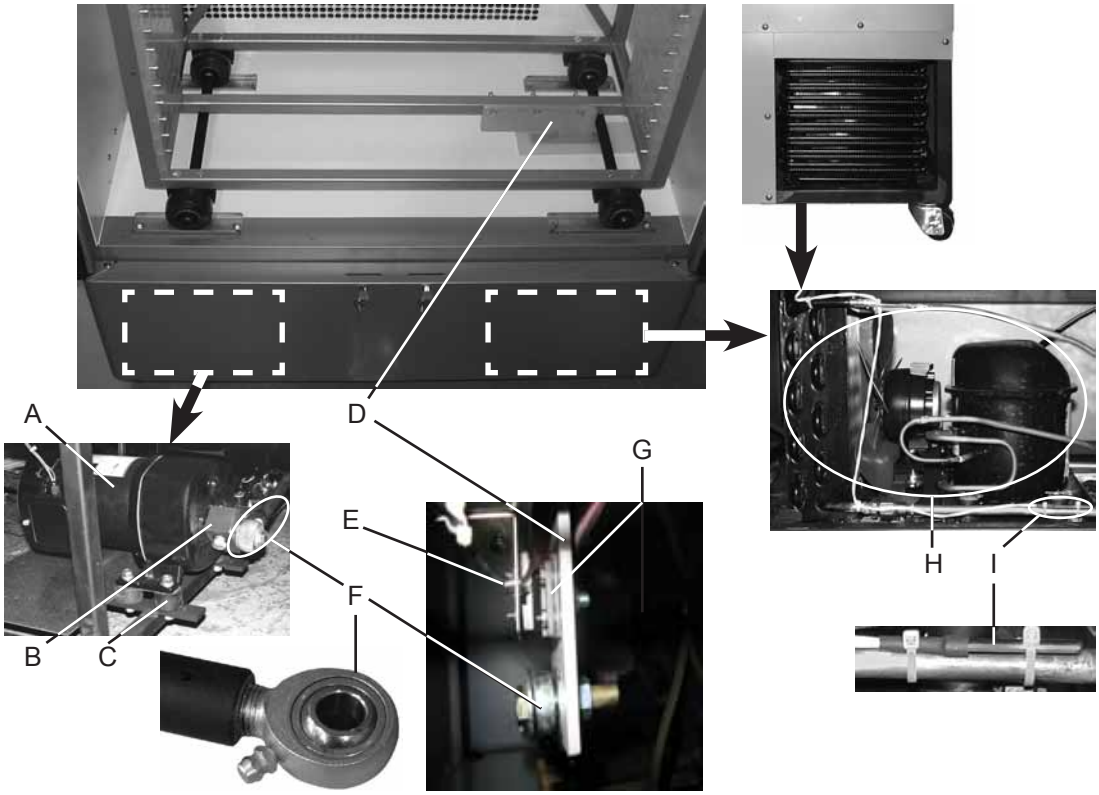
5.4.7 Floor models (PC2200, PC3200, and PC4200)



Top view of floor models (PC4200i 230 V model; in addition to parts from various models).

Label	Description	Replacement part numbers	Label on schematic
A	Power line filter	230 V models: 120400	Y
B	Monitor backup battery (1.5 V D-cell alkaline, non-rechargeable)	i.Series models: 715031	AH
C	Terminal board	400520-1	F
D	Control board	i.Series models only. Included in the control and display board kit.	E
E	Power supply board	i.Series models: 400633-1	Z
F	Agitator board	PC4200 models: 400516-1	S
G	Battery for motion alarm (9 V rechargeable Nickel-Metal Hydride (NiMH))	PC4200 models: 120232	T
H	Alarm board	Horizon Series models: 400521-1	L
Not shown	Control and display board kit	i.Series models only. Includes the control board, display board, power supply board, and interface cable. 400650-1	K and E

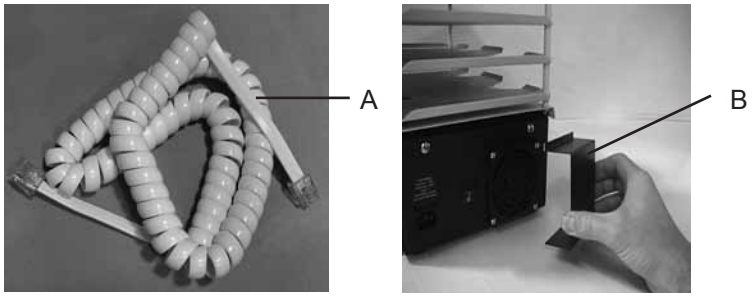
5.5 Parts inside floor model base



Parts inside the base for floor models (PC4200 model)

Label	Description	Replacement part numbers	Label on schematic
A	Agitation motor	PC4200 115 V models: 400305-1 PC4200 230 V models (includes capacitor): 400638-1	M
B	Crank block	PC4200 115 V models: 320222-1 PC4200 230 V models: 321032-1	-
C	Motor mount	PC4200 models: 220079	-
D	Drive plate	PC4200 models: 321005-1	-
E	Proximity sensor	PC4200 models: 400694-1	
F	Drive rod assembly	PC4200 models: 400111-1	
G	Proximity actuator	PC4200 models: 120125	-
H	Compressor/condensing unit	115 V models: 400669-1 230 V models: 400669-2	A
I	Condenser probe	i.Series models: 400674-1	AC
Not shown	Starting relay coil for the compressor	115 V models: 120524 230 V models: 120525	AP

5.6 Accessories



Accessories

Label	Description	Replacement part numbers
A	I/O (input/output) cable	Use when installing a Helmer i.Series agitator in the incubator. i.Series models (except PC4200i): 320842-1
B	Fan airflow deflector	Use when installing a Helmer PF15 model agitator in the incubator. PC100 models: 320967-1
Not shown	Label holder kit	Use to identify drawer contents on the built-in agitator. Includes a label holder, hardware, and an installation tool. Part of the drawer assembly. PC4200 models: 400620-1
Not shown	Power cord, short	Use when installing a Helmer agitator in the incubator. 115 V models (except PC4200): 120316 230 V models (except PC4200): 120317
Not shown	Shelf for platelet rotator	Use when installing a Helmer platelet rotator in the incubator. PC900 models: 400618-1 PC1200 models: 400619-1
Not shown	Bypass plug	Use when the remote alarm circuit is configured as normally-closed, multiple agitators are installed, and not all the agitators are Helmer i.Series. The bypass plug replaces the I/O cable for non-Helmer i.Series agitators. PC2200i and PC3200i models: 400657-1

6 Temperature controller programs

Temperature controller display and buttons

The controller is programmed at the factory with parameters and parameter values listed in this section. Parameters reside in four levels. To change a parameter value, first enter the program mode for that level. The method for accessing the program mode for each level varies.

Values that are frequently changed during operation are listed in the table below.

Parameter	Program Level	This parameter is used to
ZEro	3	Calibrate the temperature controller readout
AL.hi	1	Set high temperature alarm value: Horizon Series
AL.Lo	1	Set low temperature alarm value: Horizon Series

To view or change parameter values

NOTE: When there is no interaction for 60 seconds, the controller exits program mode.

CAUTION Changing parameter values affects incubator operation. Do not change parameter values unless instructed to do so in product documentation or by a Helmer Technical Services representative.

1. On the controller, enter Level 1 program mode. Press and hold the Up and Down arrow buttons simultaneously for about three seconds until tunE and oFF flash on the display. The temperature controller is now in Level 1 program mode.
2. Press and release the Up or Down arrow button until the parameter to view or change flashes on the display.
   - ► To access Level 2 or Level 3 parameters, select the LEUL parameter.
3. To change the value: While holding the button on the left (∗), use the Up and Down arrow buttons to adjust the value.
   - ► To access Level 2 parameters, adjust the value for the LEUL parameter to 2.
   - ► To access Level 3 parameters, adjust the value for the LEUL parameter to 3.
4. When finished adjusting the value, release all the buttons. The value is changed. If the LEUL parameter value is changed, the temperature controller is now at the program level selected.
5. Repeat steps 2 through 4 to access another program level or to view or change parameter values in the selected level.
   - ► To access Level 4 parameters, go to Level 3 program mode, select the UEr parameter, then press and hold the Up and Down arrow buttons simultaneously for about ten seconds until the LOCK parameter flashes on the display.
6. Exit program mode. Press and hold the Up and Down arrow buttons simultaneously for three seconds or until the current chamber temperature displays.

6.1 Level 1 parameters and values

NOTE: Parameters are listed in order of appearance. SP1 refers to the chamber heater; SP2 refers to the temperature alarm for Horizon Series models. Default values for AL.Lo and AL.hi may vary: the values listed are for temperature controllers programmed at the factory with an incubator setpoint of 22 °C.

Parameter	Parameter description	Default value for countertop models	Default value for floor models
tunE	Autotune selection	oFF	oFF
bAnd	SP1 proportional band (gain) or hysteresis (in °C)	7.5	3.2
int.t	SP1 integral time/reset (in minutes)	7.5	15
dEr.t	SP1 derivative time/rate	oFF	oFF
dAC	SP1 derivative approach control	0.5	0.5
CyC.t	SP1 proportional cycle-time	0.5	0.5
oFSt	SP1 offset (manual reset)	0.5	0.5
SP.LY	Lock main setpoint	oFF	oFF
SPrr	Ramp rate (if ramp is on)	0	0
SPrn	Ramp selection	oFF	oFF
SoAt	Soak time selection	--	--
AL.Lo	SP2 low alarm setpoint (in °C)	20.0 (see note above)	20.0 (see note above)
AL.hi	SP2 high alarm setpoint (in °C)	24.0 (see note above)	24.0 (see note above)
bnd.2	SP2 hysteresis or proportional band (in °C)	0.1	0.1
CyC.2	SP2 mode selection (ON/OFF or proportional cycle-time)	on.oF	on.oF
LEUL	Parameter level currently selected	1	1

6.2 Level 2 parameters and values

Parameter	Parameter description	Default value for countertop models	Default value for floor models
SP 1.P	Display of SP1 output power percentage (read-only)	(read only)	(read only)
hAnd	Selection for manual control of power for SP1	oFF	oFF
PL.1	SP1 power limit percentage	100	100
PL.2	SP2 power limit percentage (cooling)	0	0
SP2.A	Main SP2 operating mode (alarm strategy)	bAnd	bAnd
SP2.b	Subsidiary SP2 mode	nonE	nonE
di SP	Display resolution	0.1°	0.1°
hi.SC	Full scale	35.0	35.0
Lo.SC	Minimum scale	15.0	15.0
inPt	Input sensor type	rtd	rtd
unit	Units (°C/ °F)	°C	°C
LEUL	Parameter level currently selected	2	2

6.3 Level 3 parameters and values

Parameter	Parameter description	Default value for countertop models	Default value for floor models
SP 1.d	SP1 output device type	SSd1	SSd1
SP2.d	SP2 output device type (read only)	SSd2	SSd2
burn	Sensor burn-out protection type (upscale or downscale)	uP.SC	uP.SC
rEU.d	Output mode (reverse or direct)	1r.2r	1r.2r
rEU.L	LED indicator modes for SP1 and SP2 (normal or inverted)	1n.2n	1n.2n
SPAn	Sensor span adjust	0.0	0.0
2Ero	Zero sensor error (calibration across full scale)	0.0	0.0
ChEt	Selection for the control accuracy monitor	oFF	oFF
rEAd	Read control accuracy monitor results (variance)	UAr°	UAr°
tECh	Read autotune tuning cycle data	Ct A	Ct A
UEr	Software version (Select this parameter to access Level 4 parameters)	392b	392b
rSEt	Functions reset	nonE	nonE
LEUL	Parameter level currently selected	3	3

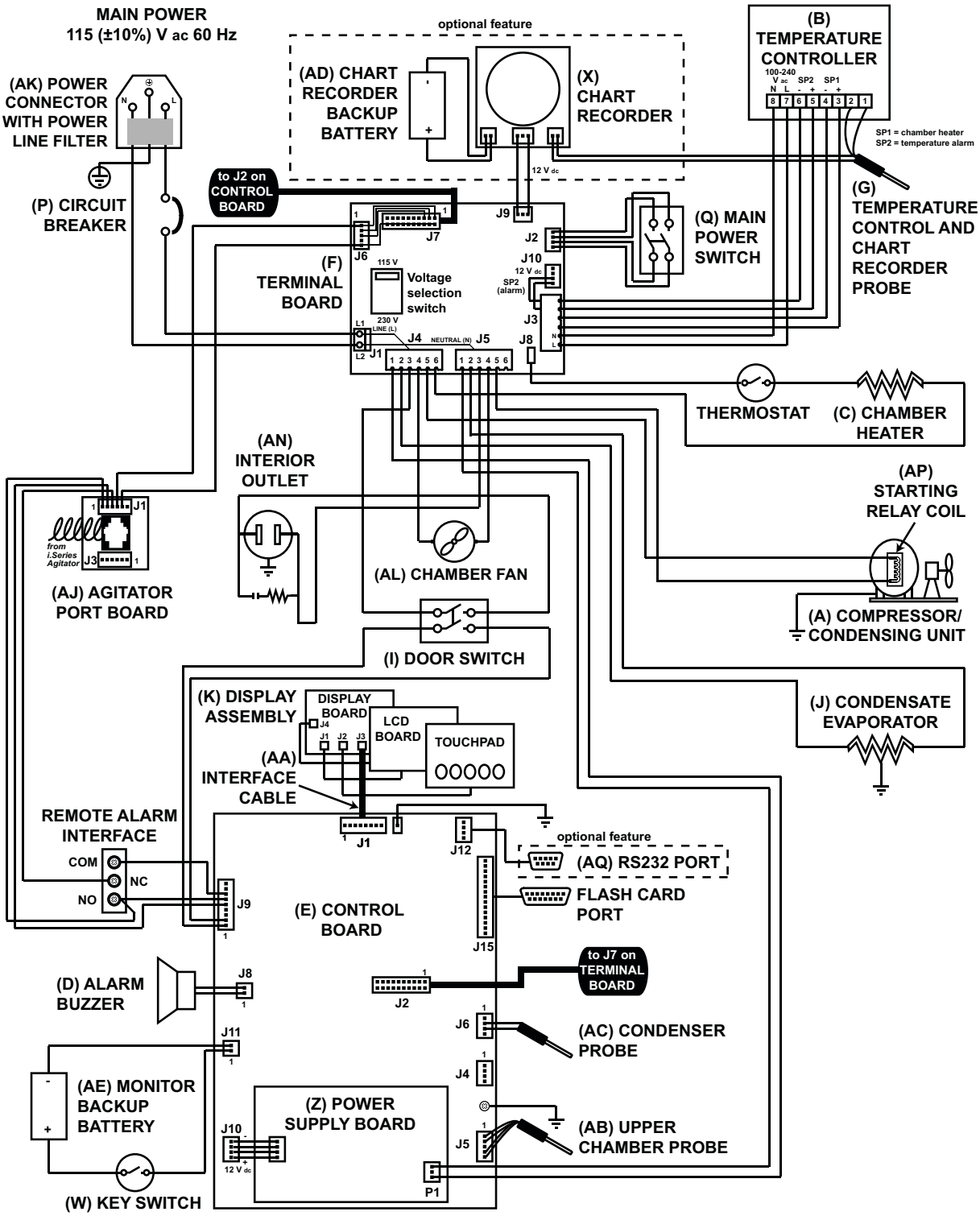
6.4 Level 4 parameters and values

Parameter	Parameter description	Default value for countertop models	Default value for floor models
LoCt	Program security lock	nonE	nonE
dEr.S	Derivative sensitivity	0.5	0.5
di S.S	Display sensitivity (or direct display of input)	dir	dir
no.AL	Disable SP2 alarm annunciator	oFF	oFF
ProG	Program mode auto-exit switch (returns display to normal mode if no activity for one minute)	Auto	Auto

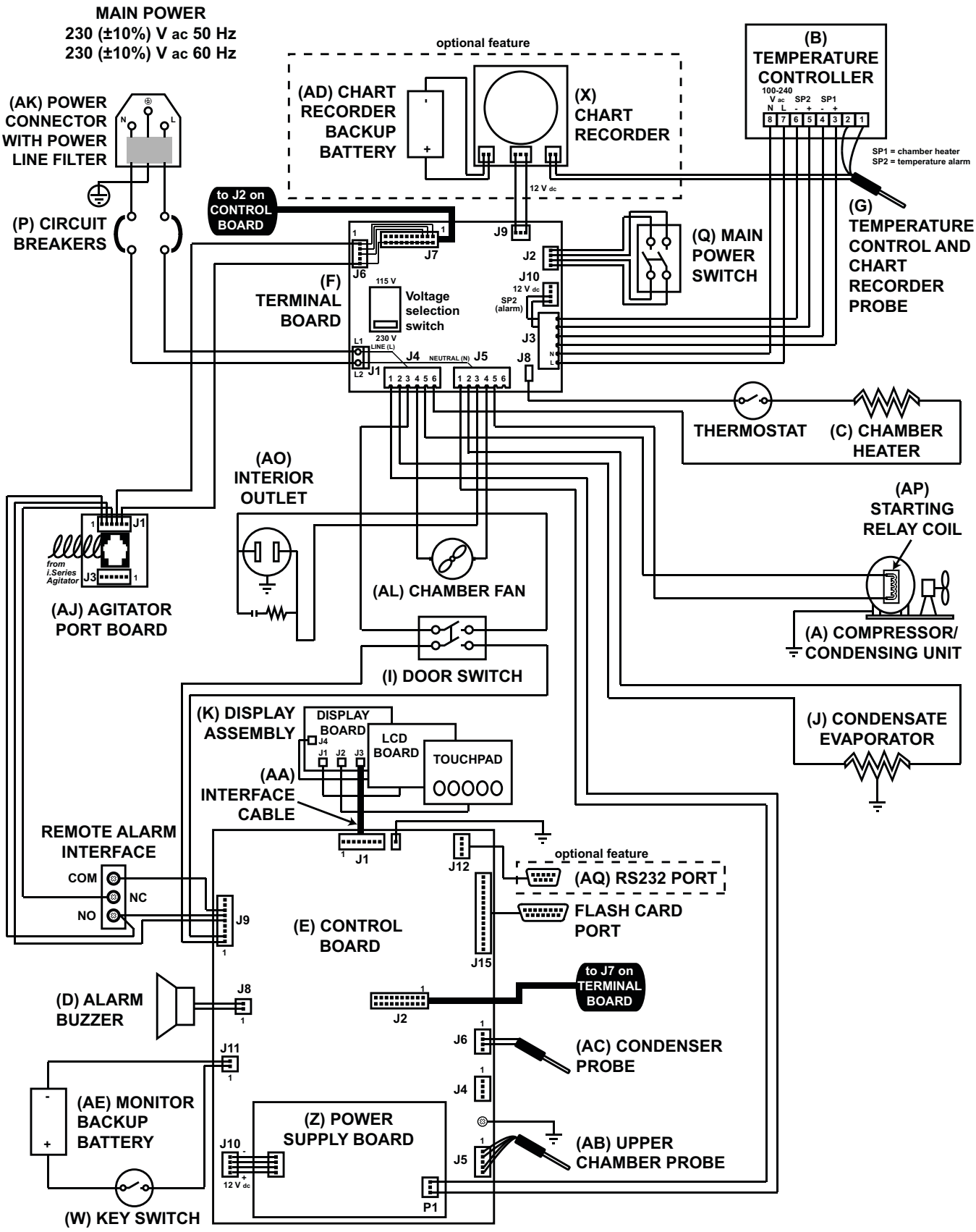
7 Schematics

7.1 i.Series model schematics

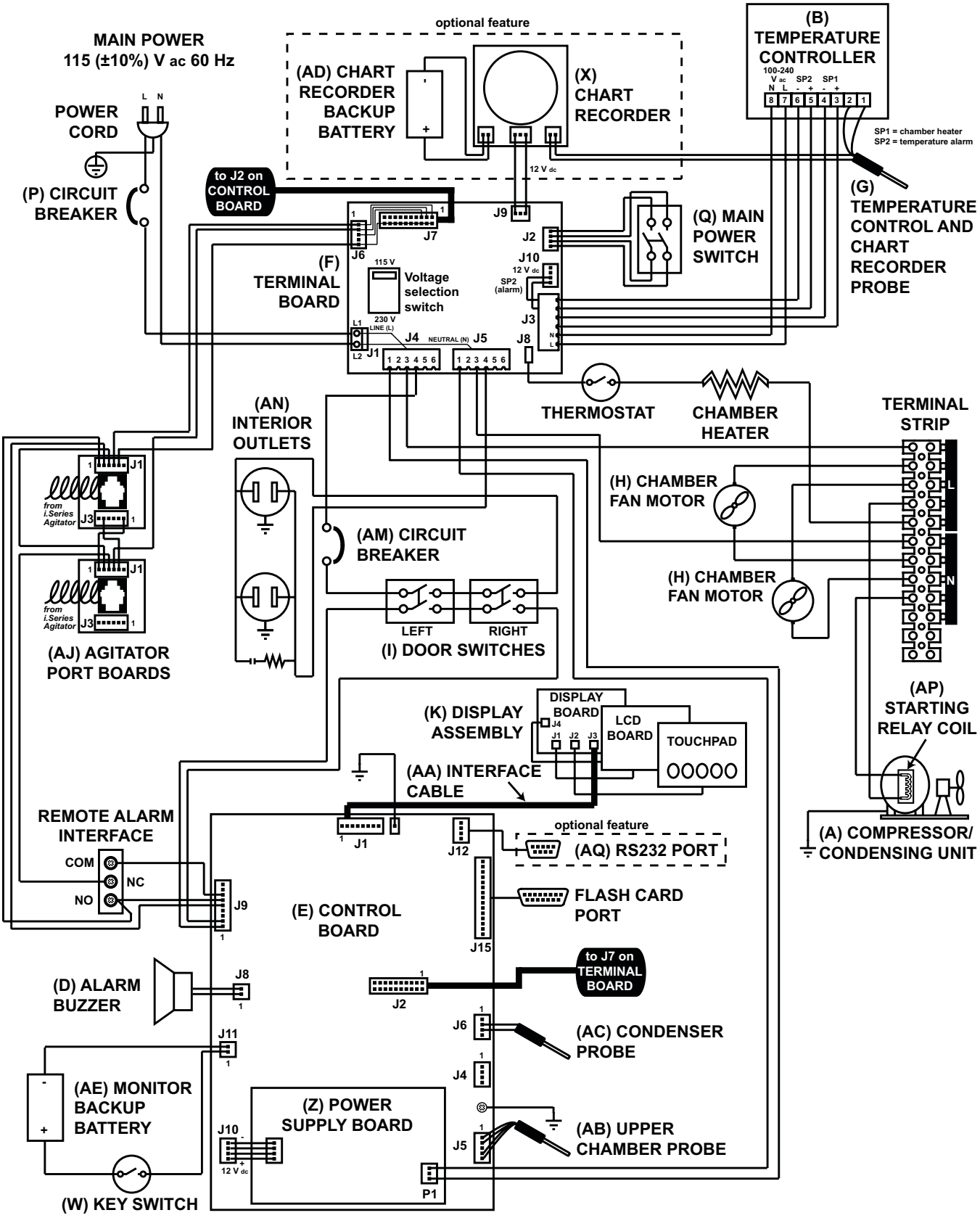
7.1.1 PC100i, PC900i, and PC1200i 115 V models



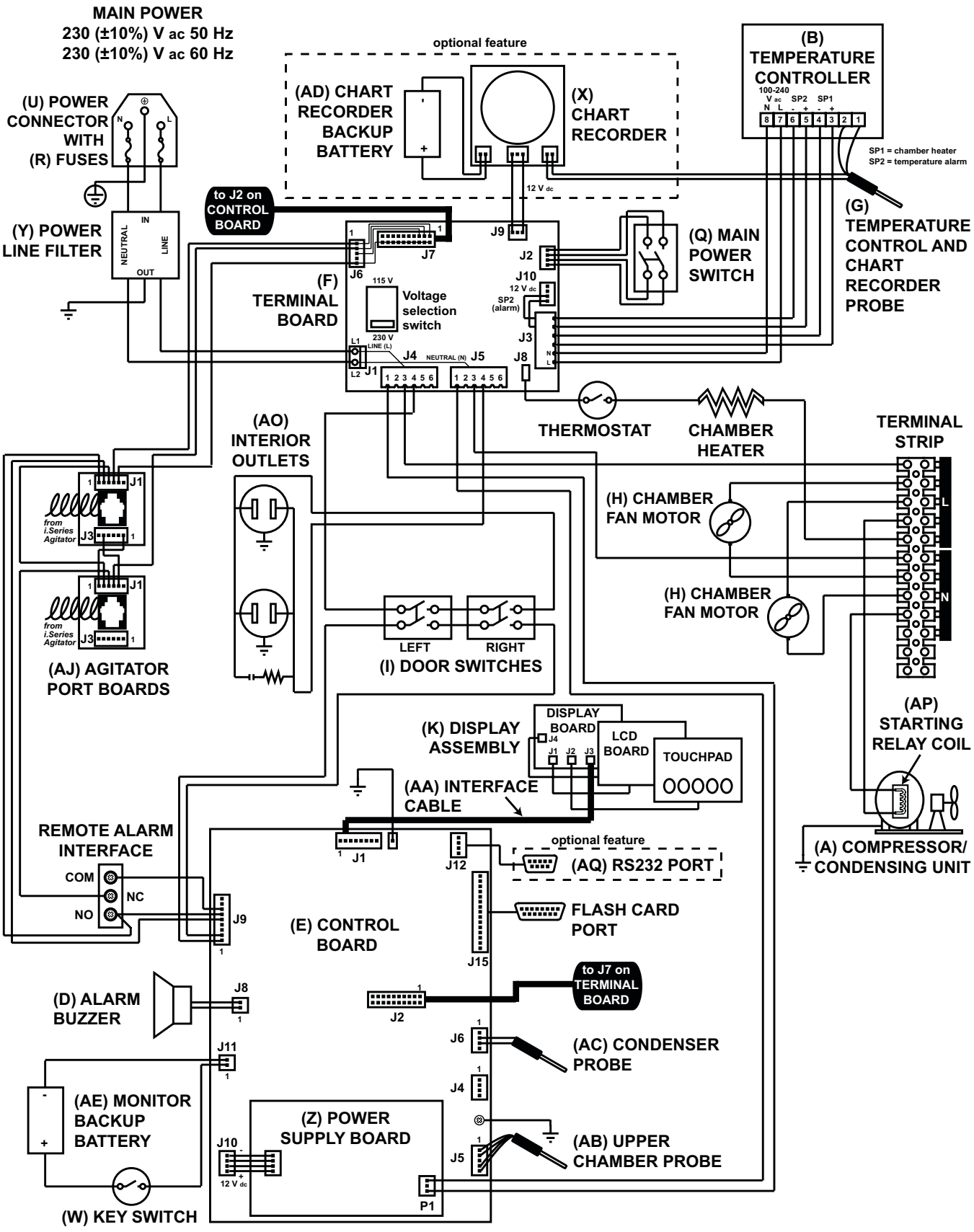
7.1.2 PC100i, PC900i, and PC1200i 230 V models



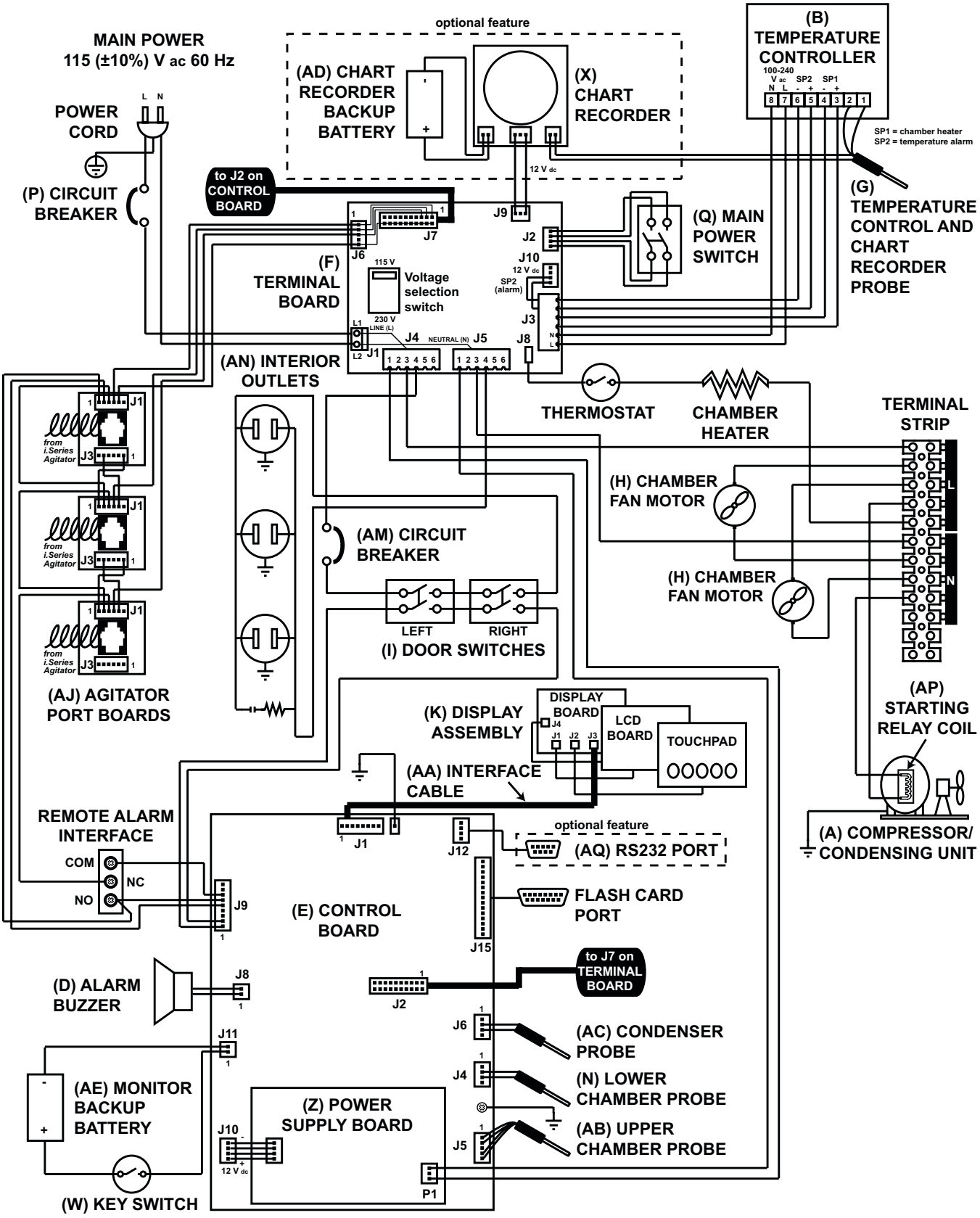
7.1.3 PC2200i 115 V models



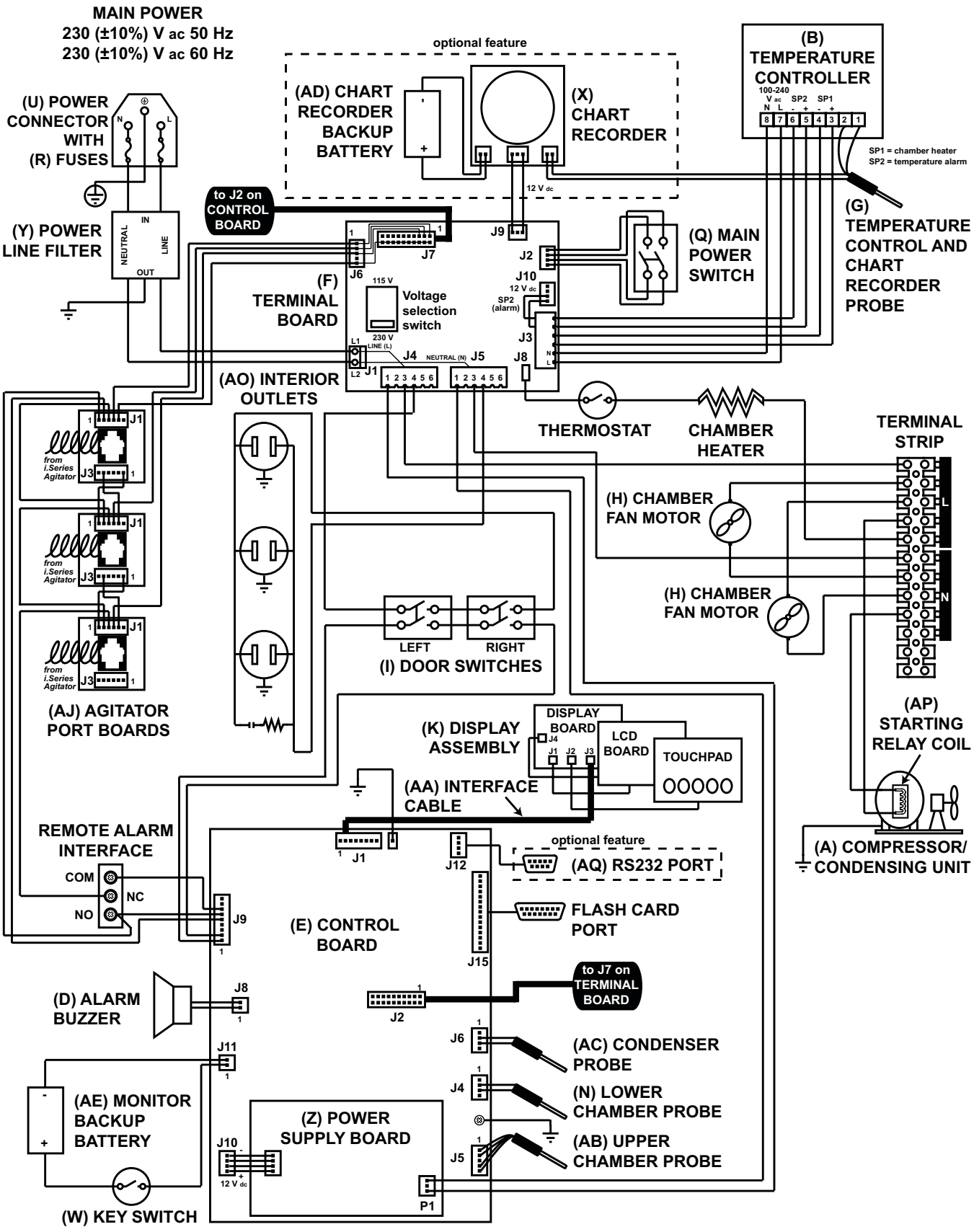
7.1.4 PC2200i 230 V models



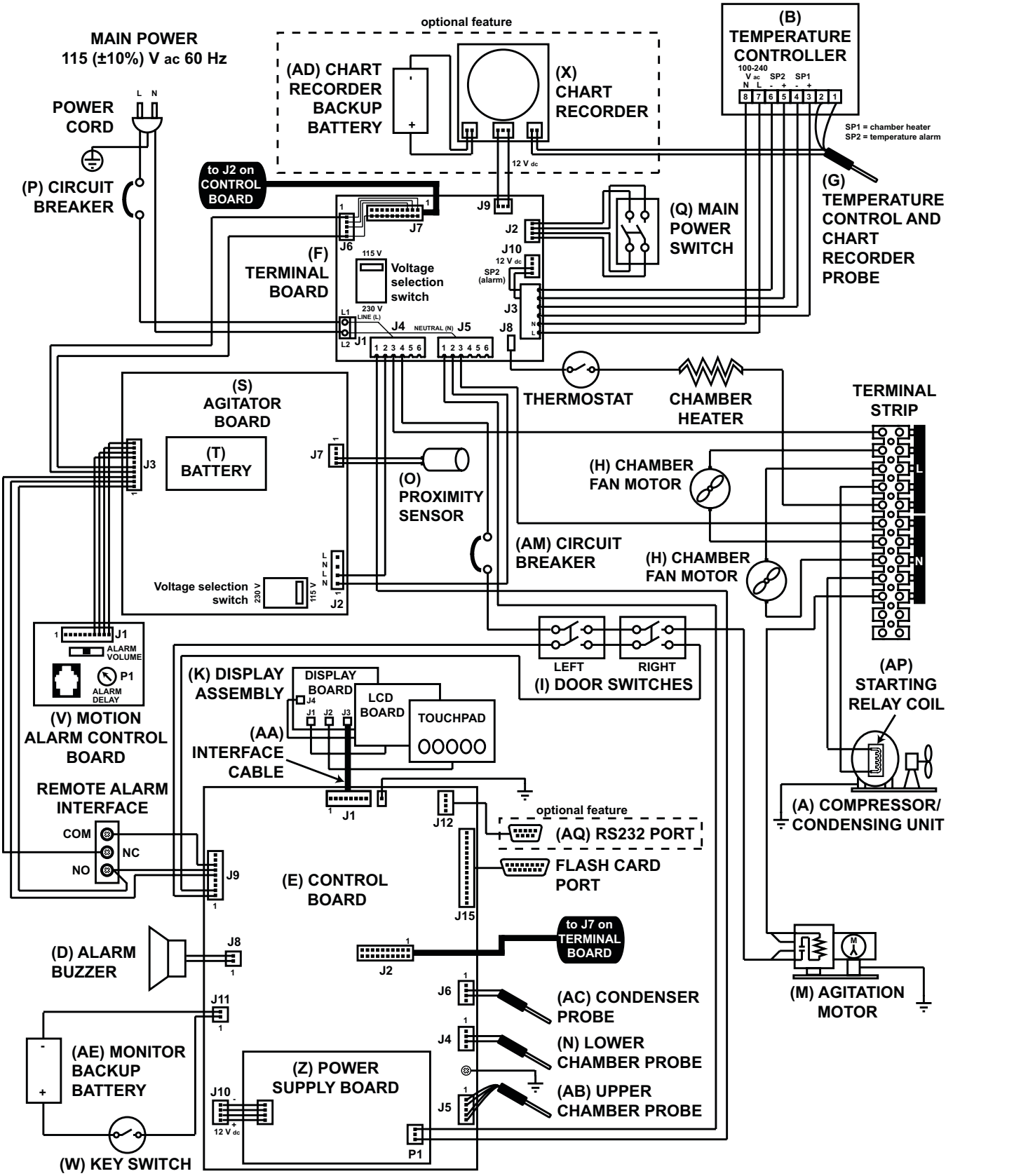
7.1.5 PC3200i 115 V models



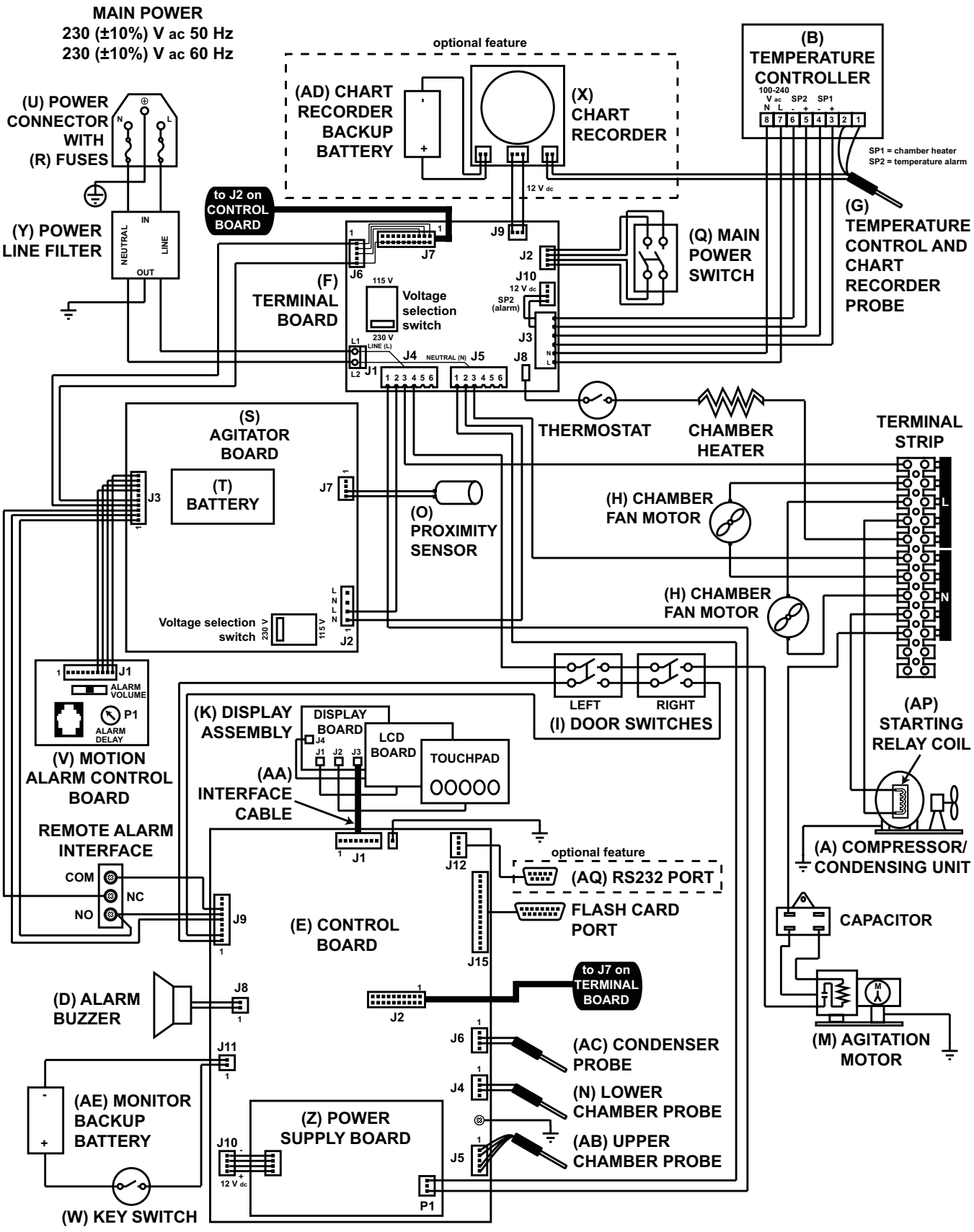
7.1.6 PC3200i 230 V models



7.1.7 PC4200i 115 V models

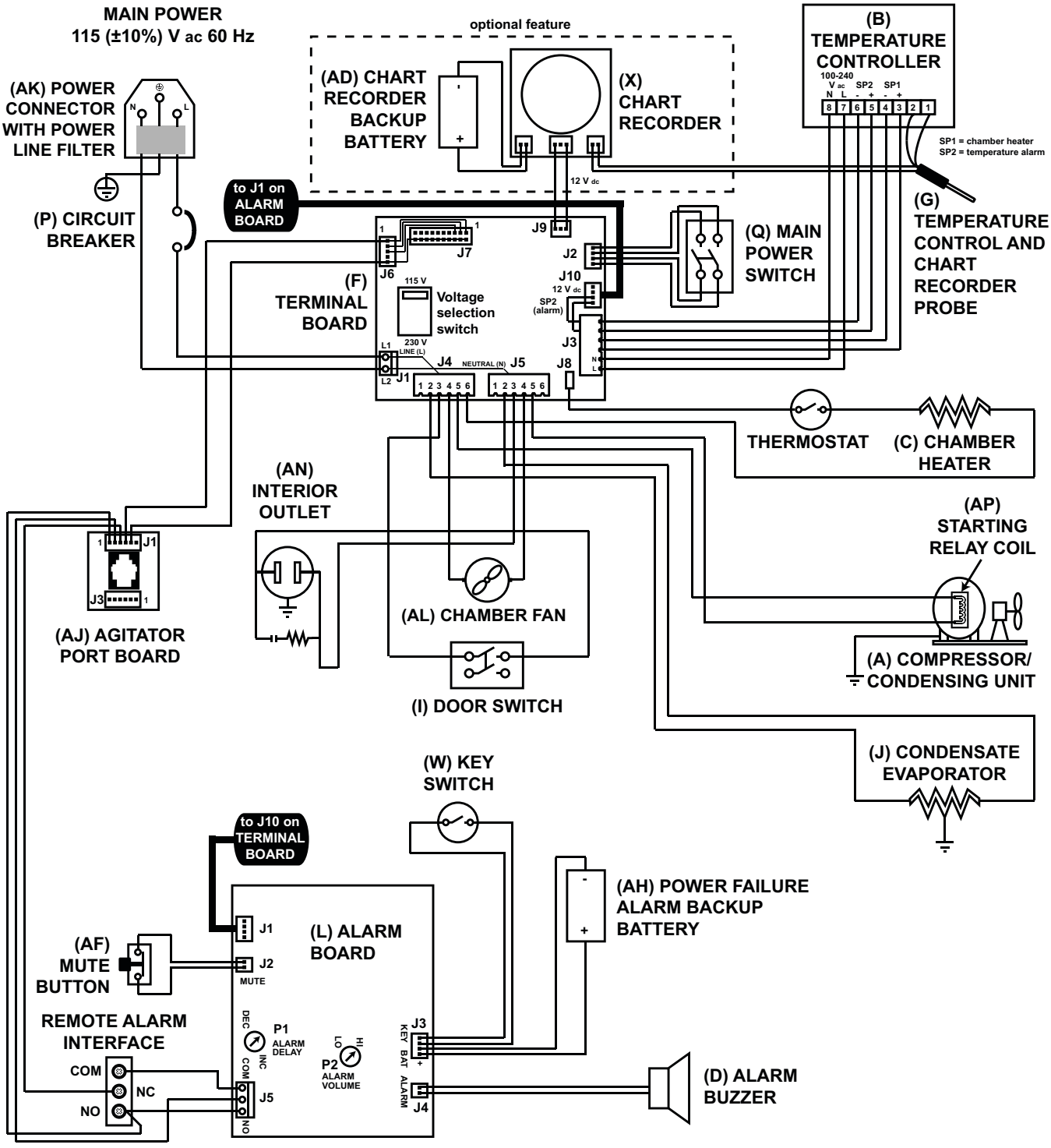


7.1.8 PC4200i 230 V models

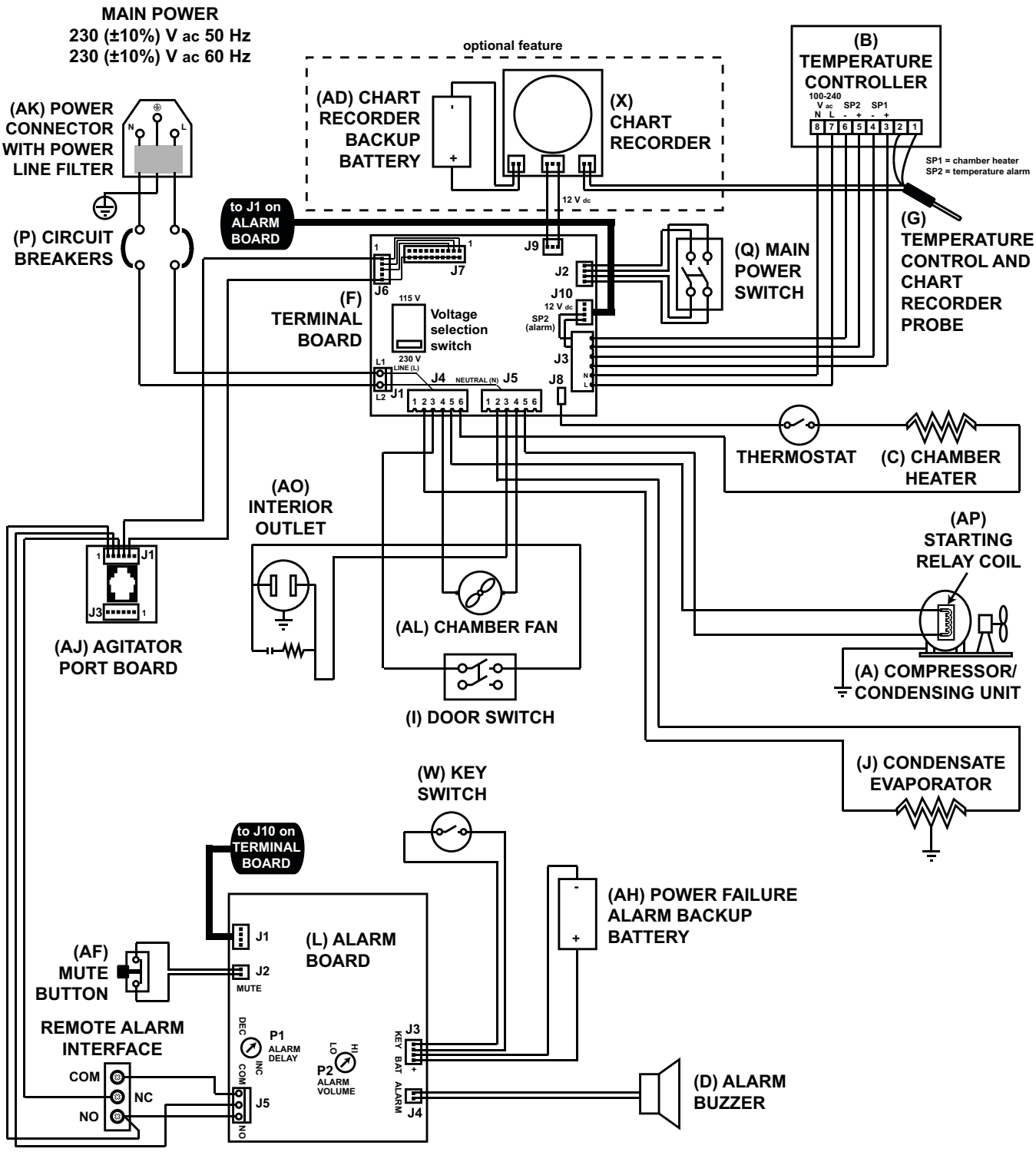


7.2 Horizon Series model schematics

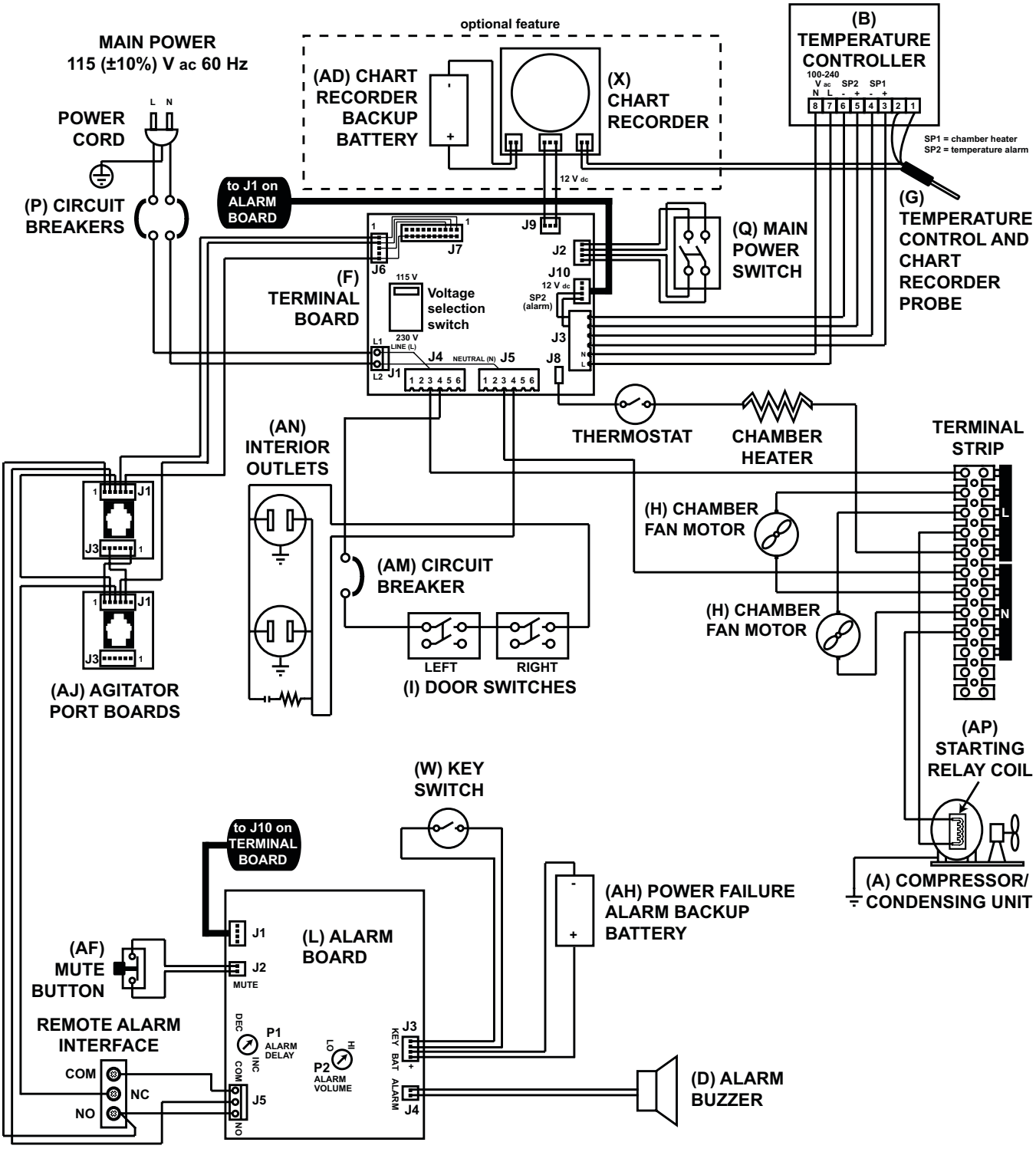
7.2.1 PC100h, PC900h, and PC1200h 115 V models



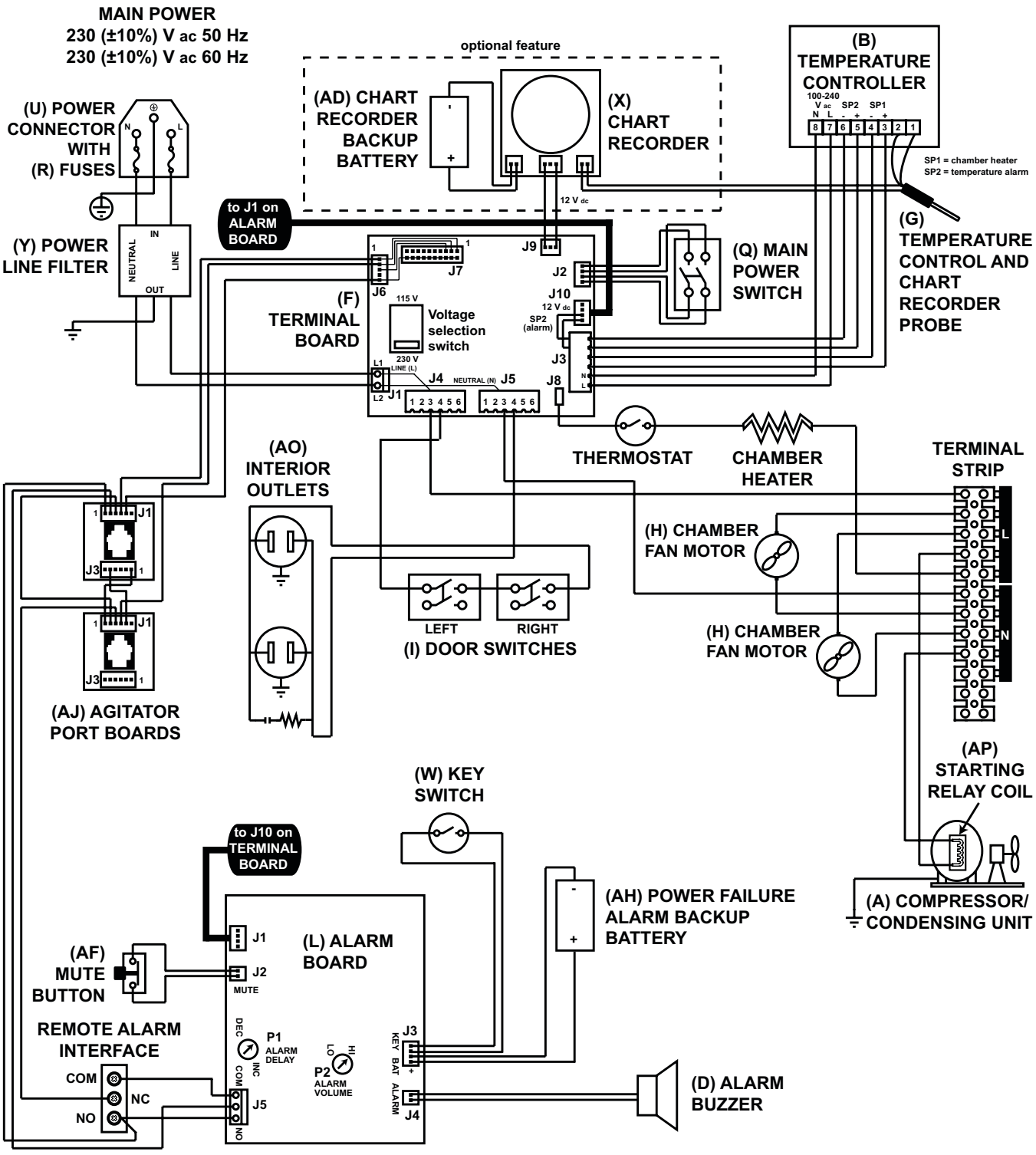
7.2.2 PC100h, PC900h, and PC1200h 230 V models



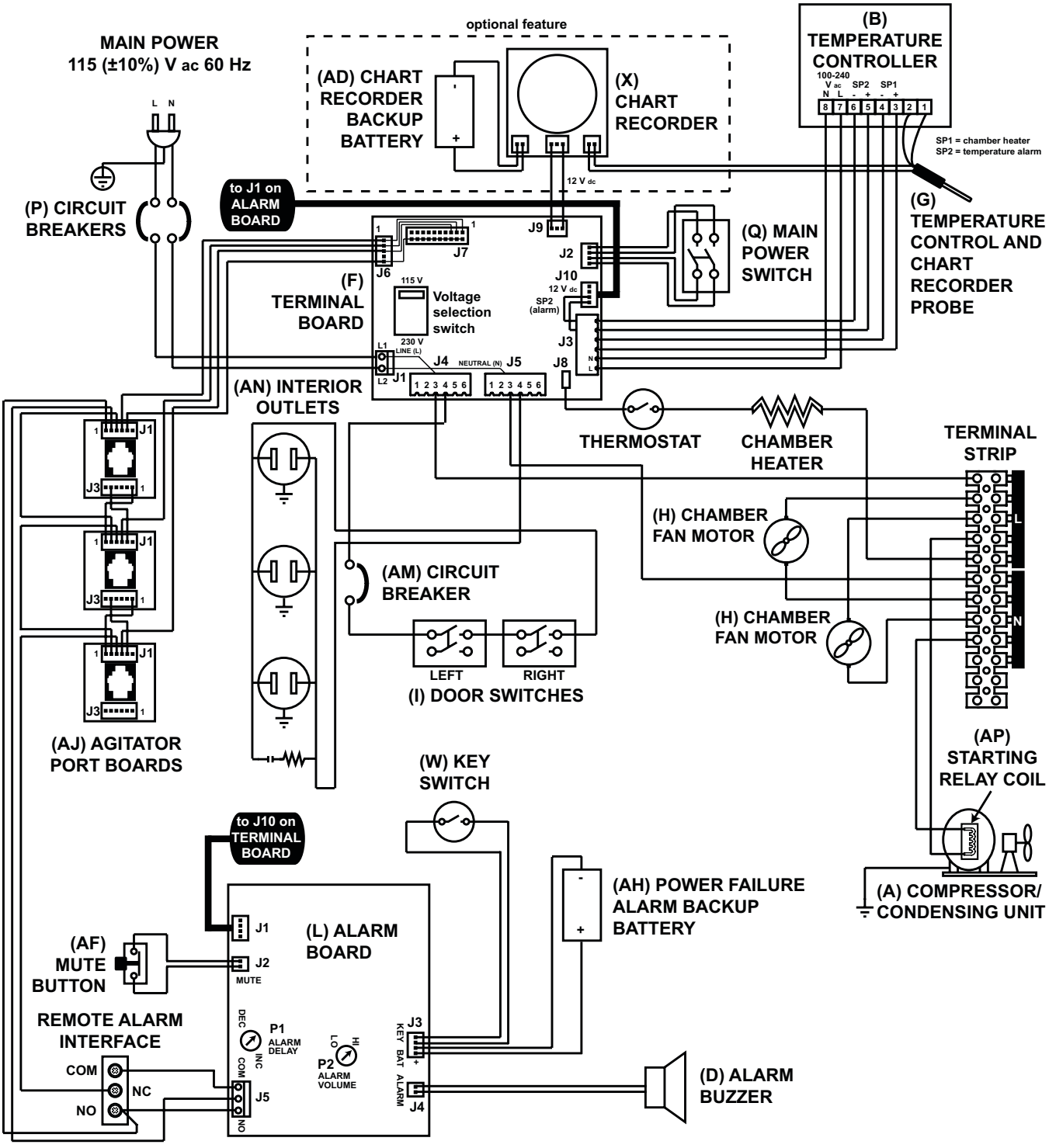
7.2.3 PC2200h 115 V models



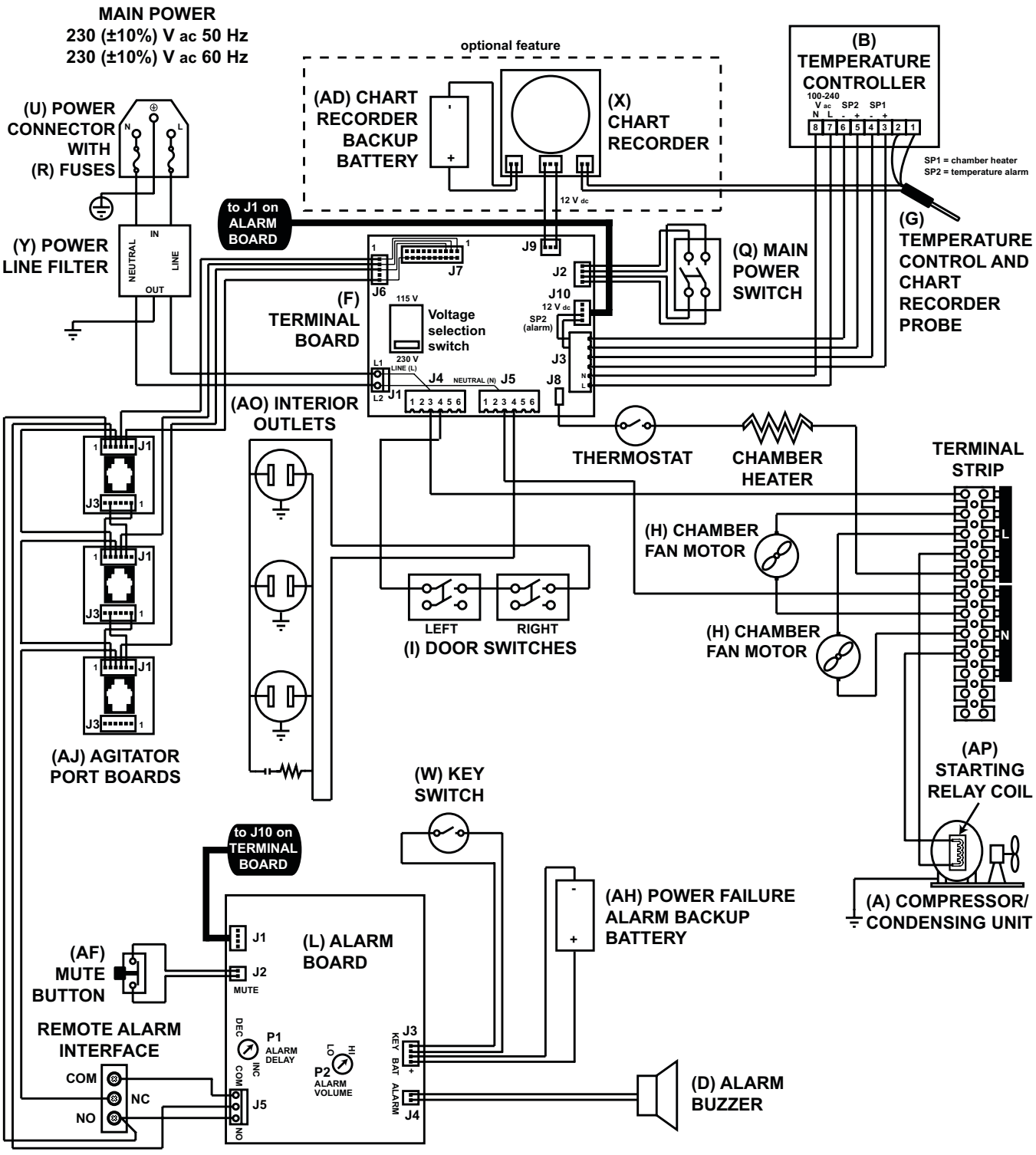
7.2.4 PC2200h 230 V models



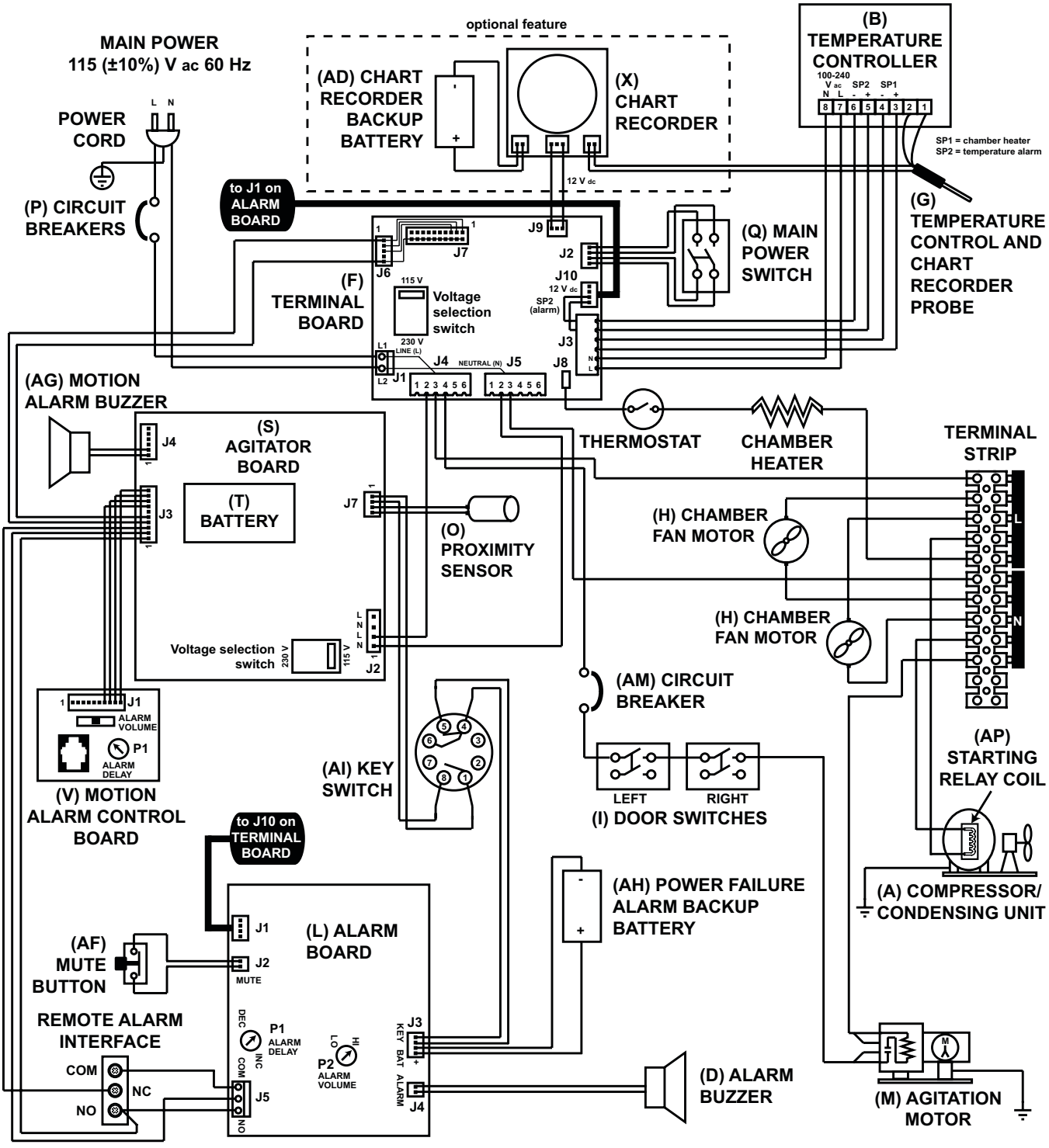
7.2.5 PC3200h 115 V models



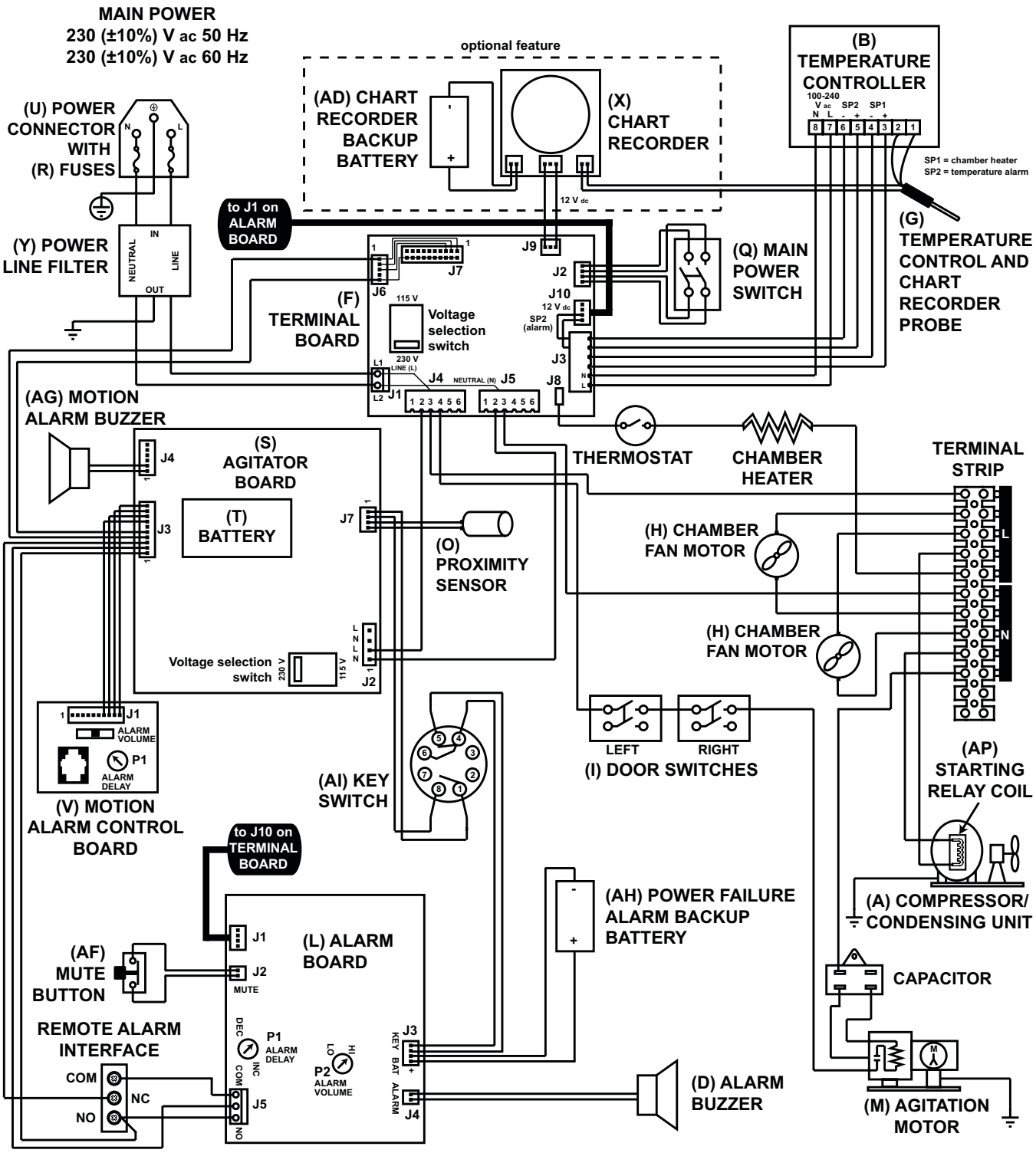
7.2.6 PC3200h 230 V models



7.2.7 PC4200h 115 V models



7.2.8 PC4200h 230 V models



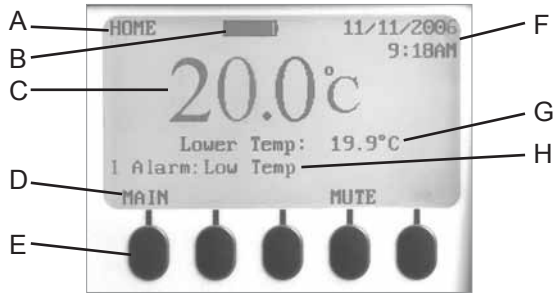
Appendix A - i.Center monitor settings

A.1 i.Center monitor

For a list of options available on all the screens, see Appendix D.

A.1.1 HOME screen

The HOME screen displays current information and is the starting point for all interaction with the monitoring system. The HOME screen appears when the HOME button is pressed from any other screen, or if there is no interaction for 2 minutes on any screen other than the password entry screen.



HOME screen on the monitoring system (PC3200i model)

Label	Description	Function
A	Screen name	Identifies the current screen
B	Battery voltage level	Displays information about the remaining life of the backup batteries for the monitoring system
C	Upper chamber temperature display	Displays current temperature sensed by the upper temperature probe
D	Button labels	Displays the option assigned to the button below it. These labels vary depending on the screen.
E	Buttons	Selects menu options in the monitoring system software
F	Date and time display	Displays current date and time as programmed in the monitoring system
G	Lower chamber temperature display (PC3200i and PC4200i)	Displays current temperature sensed by the lower temperature probe
H	Active alarm display	Indicates number and description of alarm conditions that have been reached

A.1.1.1 Functions

From the HOME screen:

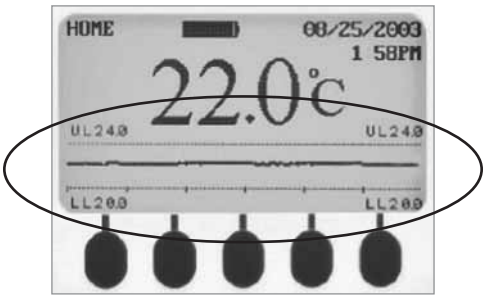
- ► View current readings from temperature probes
- ► View remaining battery charge
- ► View current time and date
- ► Access MAIN screen to view and change settings
- ► Adjust contrast
- ► View active alarms
- ► Mute audible alarms
- ► View 24 hour chamber temperature graph

A.1.1.2 Temperature graph

The graph displays current readings from the temperature probes. Default setting: enabled. See Appendix A for enable/disable instructions.

While there is power to the monitoring system, temperature data from the upper temperature probe is collected real-time. The graph displays data for the past 24 hours of operation.

The graph displays on the HOME screen after 60 seconds, assuming no active alarms. The graph clears if a button is pressed or an alarm activates.



HOME screen with temperature graph (circled)

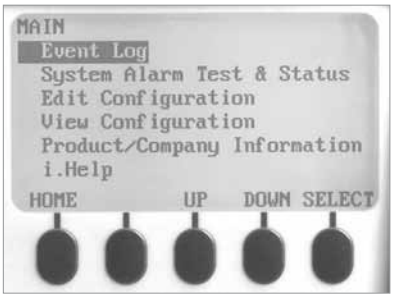
Current temperature is always to the right as time advances. The X-axis is time. The Y-axis is temperature. Vertical lines separate 4 hour periods. The horizontal line at the top of the graph is the High Alarm setpoint, while the line at the bottom is the Low Alarm setpoint. If the temperature goes outside the limits, that section of the graph flashes.

If AC power fails, the monitor continues to collect and display temperature data so long as there is backup power. If the AC power is restored before the backup power fails, there is no interruption in data collection.

NOTE: If backup power fails, there is no data collection or display. However, the collected past 24 hours of data are retained in memory. When power is restored, the stored data is displayed on the graph, and the monitor resumes collection and display of real-time temperature data.

A.1.2 MAIN screen

The MAIN screen displays functional options that access all other screens in the system.



MAIN screen functional options

1. From HOME, press the MAIN button.
2. Press the UP or DOWN button until the desired option is highlighted.
3. Press the SELECT button.

A.1.2.1 Options available from MAIN screen

Select this option	To do this
Event Log	• View historical information about alarms and operational events
System Alarm Test & Status	• Start or stop an automatic test for temperature alarms • View the number of days remaining before the paper for the temperature chart recorder needs to be changed • View the current status of the door (OPEN or CLOSED) • View the current condenser temperature
Edit Configuration (password required)	• Change the language used for text • Change date and time information • Change temperature units • Change the volume and pattern for audible alarms • Enable or disable the chart paper timer • Enable or disable the temperature graph display • Change alarm-related setpoints and timers • Calibrate the temperature probe reading • Change some settings to the factory default values • Change the password, preventing unauthorized changes • Configure the AgiTrak system to monitor agitation
View Configuration	• View the date and time formats • View alarm-related setpoints and timers • View the volume and pattern for audible alarms • View the setting for the chart paper timer • View the setting for the temperature graph display • View the settings for agitator alarms
Product/Company Information	• View the software versions for control and display components of the monitoring system • View information to contact Helmer
i.Help	• Access the on-board help system • View real-time agitation speed and cycle counts • View historical agitation event logs and details • Reset cycle counters for agitators

A.2 View configuration

From HOME, press MAIN, and select View Configuration. A list of settings appears below.

Setting	Description
Clock mode	The time format used on the HOME screen and the Event Log
Date format	The date format used on the HOME screen and on the Event Log
Door Ajar Timeout	The number of minutes the door can be open before an alarm activates
Pwr Failure Timeout	The number of minutes the incubator can be without AC power before an alarm activates
High Alarm Setpoint	The temperature at which the High Temperature Alarm activates
Low Alarm Setpoint	The temperature at which the Low Temperature Alarm activates
Cond. Alarm Setpoint	The temperature at which the Condenser Temperature Alarm activates
Alarm Volume	The volume for audible alarms
Alarm Pulse	The pattern for audible alarms
Chart Paper Timer; or Chart Paper Days Left	Setting for the chart paper timer (f disabled); or the number of days remaining before chart paper needs to be changed (if TCR is installed)
Temperature Graph	The setting for the temperature graph feature (Enabled or Disabled)
Agitator Alarms	The settings for the motion alarm for a) each Helmer i.Series agitator installed in the incubator, or b) the built-in agitator on PC4200i models. All incubators are programmed to monitor three positions, even though some models accommodate fewer agitators. Positions that are not in use are set to OFF. Positions that are in use are set to ON and display the number of minutes the agitator can be stopped before an alarm activates.

A.3 View incubator status

View the status of the incubator on the i.Center monitoring system. The most important information is displayed on the HOME screen, but additional information is available from other screens.

A.3.1 Agitation information

For each i.Series agitator installed in the incubator, or for a built-in agitator, cycle counts and agitation speed may be viewed in real-time. The cycle counter information is useful for troubleshooting problems with the motion sensor, or for scheduling additional preventive maintenance items as needed.

Real-time agitation speed

1. HOME screen --> MAIN screen --> i.Help option --> AGITATOR INFORMATION screen
   - **a** Highlight Agitator RPM, and press Select.
   - **b** The AGITATOR RPM screen displays the current speed for each agitator.
2. Press BACK to return to previous screen, or HOME to exit.

Real-time agitator cycle counts

1. HOME screen --> MAIN screen --> i.Help option --> AGITATOR INFORMATION screen
2. To display AGITATOR TOTAL CYCLE COUNT screen, select one:
   - **a** Press the Down button until Agitator RPM is highlighted, then press the Select button. The AGITATOR RPM screen appears with the current speed for each agitator. Press the Cycles button.
   - **b** Select Agitator Cycles. Cycle counts are in units of thousands.
3. Press BACK to return to previous screen, or HOME to exit.

A.3.2 View chart paper status

► From MAIN screen, select System Alarm Test & Status option, which shows the number of days remaining (if chart paper timer is enabled) or the status of the timer (if disabled).

A.3.3 View door status

► From MAIN, select System Alarm Test & Status, which shows the door status (OPEN or CLOSED).

A.3.4 View condenser temperature

The temperature of the condenser discharge line is often useful for troubleshooting.

► From MAIN screen, select System Alarm Test & Status option, which shows condenser temperature.

A.4 View historical information

The i.Center system has an event log that displays:

- **a** Information about the previous fifty alarm events
- **b** The number of door openings for the current and previous day
- **c** Information about when the agitator cycle counters were reset

A.4.1 View event log

A.4.1.1 Log format

From the MAIN screen, select the Event Log option. The EVENT LOG screen appears.

The format for the event log is:

```
EVENT LOG  Door    AA/AA BB/BB
           Openings:   C     D
EE F GG HH/HH/HH II:IIJ KK.KK°L
```

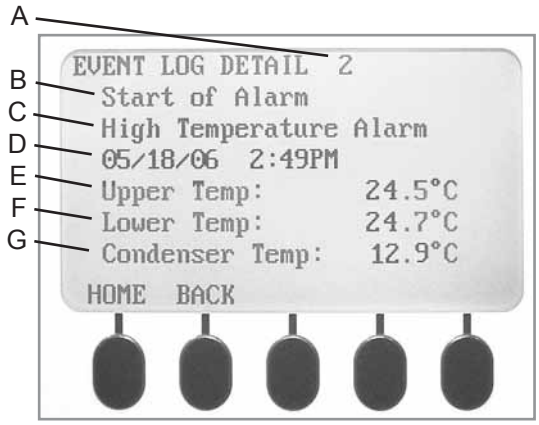
Item	Description
AA/AA	Current date (month and day)
BB/BB	Previous date (month and day)
C	Number of door openings on current date
D	Number of door openings on previous date
EE	Event number. The most recent event is numbered as 1. Values can be 1-50.
F	Event. S indicates the start of an alarm condition. R indicates the alarm was reset and the system returned to normal.
GG	Alarm Type. Alarm types: DR Door Open HI High temperature LO Low temperature CO Condenser temperature NB No Battery AC Power failure A(n) Agitator (n) stopped (where n is 1, 2, or 3, depending on model)
HH/HH/HH	Date of event (month and day, and the last two digits of the year)
II:II	Time (hours and minutes) of event.
J	Time (appears for 12-hour format). A indicates AM, and P indicates PM.
KK.KK	Upper chamber temperature at time of event.
L	Temperature measurement system. C = Celsius, F = Fahrenheit.

A.4.1.2 Event details

1 From the EVENT LOG screen, highlight the desired event number.
2 Press SELECT. The EVENT LOG DETAIL screen for that event number displays.
3 Press BACK to return to previous screen, or HOME to exit.

NOTE: If the entire line for an event is highlighted, the alarm for that event was caused by a system self-test initiated by an operator.

A.4.1.3 EVENT LOG DETAIL screen



EVENT LOG DETAIL screen

Label	Description
A	Event number
B	Event
C	Alarm Type
D	Date and time of event
E	Upper chamber temperature at time of event
F	Lower chamber temperature at time of event (Available on PC3200i and PC4200i)
G	Condenser discharge line temperature at time of event

A.4.2 View agitator count log

The i.Center monitoring system has 3 cycle counter logs, one for each agitator. Logs display date, time, and cycle count for the previous 50 reset events. Each time a counter is reset for a particular agitator, an event is recorded in the log for that agitator.

1 HOME screen --> MAIN screen --> i.Help option --> AGITATOR INFORMATION screen
2 Highlight Agitator Count Logs, and select.
3 Highlight the desired log, and press Enter. The count log screen appears.
4 To view older events in the log, scroll using UP and DOWN arrows.
5 Press BACK to return to previous screen, or HOME to exit.

A.4.2.1 Agitator count log format

The format for the event log is:

```
Total Counts       AAAAAAAAA
BB CC/CC/CC DD:DDE FFFFFFFFF
```

Item	Description
AAAAAAAAA	Total cycles counted
BB	Reset event number. The most recent event is numbered as 1. Values can be 1-50.
CC/CC/CC	Date of event (month and day, and the last two digits of the year)
DD:DD	Time (hours and minutes) of event.
E	Time (appears for 12-hour format). A indicates AM, and P indicates PM.
FFFFFFFFF	Cycles counted since the last reset event.

A.5 Getting help

1. From the MAIN screen, select the i.Help option.
2. Highlight and select the topic of interest.
3. Follow on-screen instructions and view additional information.
4. When finished, press the HOME button.

NOTE: The level of detail in i.Help may differ slightly from the contents of this manual.

A.6 Change display format settings

NOTE: A password is needed to edit settings.

A.6.1 Change display language

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. CONFIGURATION screen--> System Options --> Language setting.
3. Press the INC or DEC button to display desired language.
4. Press BACK to return to previous screen, or HOME to exit. The setting is saved. Display text changes to the selected language.

A.6.2 Change date and time information

It is possible to change the current date and time settings as well as the display format. The date and time are displayed on the HOME screen and in the Event Log.

The **Date Format** setting controls the order in which the month (mm) and day (dd) are displayed. The year (yyyy) is always displayed last. The month setting is a two-digit number (01-12) representing the month. The day setting is a two-digit number (01-31) representing the day. The default format is mm/dd/yyyy.

The **Clock Mode** setting controls whether the time is displayed in a 12-hour or 24-hour format. For both settings, the hour and minute values may be changed. When using the 12-hour format, AM or PM time must be specified. The default format is 12-hour.

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. From the CONFIGURATION screen, select Set Date & Time.
3. Press the DOWN button to highlight the desired setting.
4. Press the INC or DEC button until the new value appears.
5. To change other settings on this screen, repeat steps 3-4.
6. Press BACK to return to previous screen, or HOME to exit. The setting is saved.

A.6.3 Change temperature units

Available options are Celsius or Fahrenheit (°F). The default temperature unit is Celsius (°C).

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. From the CONFIGURATION screen, select the System Options option.
3. Press the DOWN button to highlight Temperature Units.
4. Press the INC or DEC button until the desired units appear.
5. Press BACK to return to previous screen, or HOME to exit. The setting is saved.

A.7 Change alarm settings

A.7.1 Change setpoints for temperature alarms

The monitoring system has alarms which are activated if the temperature is too high or too low.

The High Alarm setpoint specifies the temperature at which the High Temperature Alarm activates. If the temperature detected by the upper chamber probe is greater than or equal to this value, the alarm activates. The default setpoint is 24 °C. The setpoint can be changed to a value from -40 °C to 40 °C.

The Low Alarm setpoint specifies the temperature at which the Low Temperature Alarm activates. If the temperature detected by the upper chamber probe is less than or equal to this value, the alarm activates. The default setpoint is 20 °C. The setpoint can be changed to a value from -40 °C to 40 °C.

The Cond. Alarm setpoint specifies the temperature at which the Condenser Temperature Alarm activates. If the temperature of the condenser discharge line is greater than or equal to this value, the alarm activates. The default setpoint is 50 °C. The setpoint can be changed to a value from -40 °C to 80 °C.

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. From the CONFIGURATION screen, select Alarm Setpoints.
3. Press the DOWN button to highlight the setting to be changed.
4. Press the INC or DEC button until the new value appears.
5. Press BACK to return to previous screen, or HOME to exit. The setting is saved.

A.7.2 Change setpoint for door open and power failure alarms

Door Ajar Timeout specifies the longest time the incubator door(s) can be open prior to alarm.

Power Failure Timeout specifies the longest time the incubator can be without AC power prior to alarm.

For both alarms: If the time elapsed since the last time [the door was opened or the power failured] is greater than or equal to this value, an alarm activates. The default setpoint is 3 minutes. The setpoint can be changed to any value, in increments of 1 minute, from 0 to 60 minutes.

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. From the CONFIGURATION screen, select the Alarm Setpoints option.
3. Press the DOWN button to highlight the desired setting.
4. Press the INC or DEC button until the new value appears.
5. To change other settings on this screen, repeat steps 3-4.
6. Press BACK to return to previous screen, or HOME to exit. The setting is saved.

A.7.3 Agitrak system: motion alarm settings

The AgiTrak system is part of the i.Center monitor. It receives information from as many as three agitator positions simultaneously. The topmost agitator is always numbered 1, as is the PC 4200i agitator.

PC100i, PC900i, and PC1200i models each have one available position, while the PC2200i has two and the PC3200i has three. The incubator has an I/O connector for each position, through which the AgiTrak system receives speed information. The PC4200 i built-in agitator transmits speed information directly.

AgiTrak monitors current agitation speed. If no motion is detected for the pre-configured amount of time, the system activates an alarm and records the alarm event(s) in the event log.

For agitation information to be monitored correctly, each corresponding position must be enabled. If a position is not available, not in use, or has a Horizon Series agitator connected, it should be disabled to prevent false alarms. For example, a PC100i model has one position, so positions 2 and 3 should be disabled. The available values for this setting are ON (enabled) and OFF (disabled). The default setting is ON for all available agitator positions, and OFF for all others.

The Agitator Alarm Setpoint specifies the longest the agitator can be stopped prior to alarm. If the time elapsed is greater than or equal to this value, an alarm activates. The default setpoint is 3 minutes. It can be changed in increments of 1 minute, from 0 to 60 minutes.

NOTE: The AgiTrak system is intended to replace each i.Series agitator alarm system, which should be disabled to prevent confusion from multiple alarms.

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. From the CONFIGURATION screen, select SET ALARM SETPOINT.
3. Press the Down button to highlight the setting to be changed.
4. Press the INC or DEC button until the new value appears.
5. Press BACK to return to previous screen, or HOME to exit. The setting is saved.

A.7.4 Change delay period for PC4200i motion alarm

Unlike other i.Series models, the PC4200i model has an alarm delay control. When the agitator stops, this control delays when alarm information is sent directly to the remote alarm interface on the incubator, but does not delay when speed information is sent to the AgiTrak system. When the Agitator Alarm Setpoint is reached, the AgiTrak system activates an alarm, which is also sent to the remote alarm interface on the incubator.

NOTE: To prevent confusion from an alarm being communicated by an external monitoring device, but not by the incubator, make sure the alarm delay control is set to a value greater than the Agitator 1 Setpoint. The alarm delay control for the motion alarm is located on the rear of the incubator.

Alarm delay control for the motion alarm (circled)

The delay period can be set to a value between approximately 5 seconds and 8 minutes. The default delay period is set at the halfway point (approximately 4 to 5 minutes).

1. Using a small, flat-head screwdriver, turn the alarm delay control counter-clockwise until it stops. This decreases the delay period to approximately 5 seconds.
2. Using the screwdriver, increase the delay period by turning the alarm delay control clockwise to the appropriate position (greater than the value for the Agitator 1 Setpoint). Turning the control clockwise until it stops will set the delay period to approximately 8 minutes.

A.7.5 Change audible alarm characteristics

It is possible to change volume and pattern. This is useful if several pieces of equipment with alarms are co-sited, and distinguishing the source of the alarm quickly is desirable.

The Alarm Volume controls volume for all audible alarms. The default value is 10. The volume can be changed to any value, in increments of 1, from 1 to 10, where 1 is the quietest and 10 is the loudest.

The Alarm Pulse specifies the sound-silence pattern. The default value is Single. The available patterns are Constant (continuous sound), Single (pattern of one beep followed by silence), Double (two beeps, then silence), and Triple (three beeps, then silence).

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. From the CONFIGURATION screen, select System Options.
3. Press the DOWN button until the setting to be changed is highlighted.
4. Press the INC or DEC button until the new value appears.
5. To change other settings on this screen, repeat steps 3-4.
6. Press BACK to return to previous screen, or HOME to exit. The setting is saved.

A.7.6 Change chart paper timer setting

The i.Center has a visual alarm that activates when the chart paper needs to be changed. The default setting is Enabled. Available options are Reset, Enabled, and Disabled. Resetting the timer also enables it. Selecting Enabled enables and resets the alarm if it was disabled. Selecting Disabled disables the alarm.

One piece of chart paper records temperatures continuously for seven days. The timer activates an alarm exactly 6.5 days from when the timer is reset. The timer period cannot be changed.

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. From the CONFIGURATION screen, select System Options.
3. Press the DOWN button to highlight the Chart Paper Timer setting.
4. Press the INC or DEC button until the desired new setting appears.
5. To save setting, select one:
   - ► If the selection is either Enabled or Disabled, press BACK to return to previous screen, or HOME to exit. The setting is saved.
   - ► If the selection is Reset:
     - **a** Press the DOWN button. The CHART RECORDER PAPER screen appears.
     - **b** Press one of the PAPER-CHANGED buttons (either the third or fourth button from the left). The SYSTEM OPTIONS screen appears with Chart Paper Timer set to Enabled.
     - **c** Press BACK to return to previous screen, or HOME to exit. The setting is saved.

A.8 Enable or disable temperature graph

Available options are Enabled and Disabled. The default setting is Enabled.

1. HOME screen --> MAIN screen --> Edit Configuration --> Enter password
2. From the CONFIGURATION screen, select System Options.
3. Press the DOWN button until the Temperature Graph setting is highlighted.
4. Press the INC or DEC button until the desired new setting appears.
5. Press BACK to return to previous screen, or HOME to exit. The setting is saved.

A.9 Change password

The default password is 1234. A password must use 4 digits between 1 and 5.

1. On CONFIGURATION screen, select Change Password.
2. Enter new password, and re-enter when prompted
   - ► If entries match, *update* message displays.
   - ► If entries do not match, *incorrect match* message displays. Repeat procedure.

A.10 Restoring factory defaults

The table settings below may be changed simultaneously to factory default values.

This setting	Is restored to this value
High Alarm Setpoint	24.0 °C
Low Alarm Setpoint	20.0 °C
Cond. Alarm Setpoint	50.0 °C
Door Ajar Timeout	3 minutes
Power Failure Timeout	3 minutes
Chart Paper Timer	6.5 days
Agitator 1 Setpoint	ON, 3 minutes
Agitator 2 Setpoint	ON, 3 minutes
Agitator 3 Setpoint	ON, 3 minutes

1 Access the CONFIGURATION screen.
   - **a** From the HOME screen, press the MAIN button. The MAIN screen appears.
   - **b** Select the Edit Configuration option. When prompted, enter the password.
   - **c** If the password is correct, the CONFIGURATION screen appears with the first option highlighted.

2 From the CONFIGURATION screen, select the Factory Default Settings option. The FACTORY DEFAULT SETTINGS screen appears.

3 Do one:
   - ► To change the settings to the factory defaults, press the ENTER button. The CONFIGURATION screen appears and the settings are saved.
   - ► The reject the new value, press the BACK or HOME button to exit the FACTORY DEFAULT SETTINGS screen.

A.11 Calibration & Testing

Determine accurate chamber temperature, and if needed, calibrate the monitor.

A.11.1 Calibrate i.Center monitor display

1 Obtain an independent thermometer, calibrated and traceable per national standards.

2 Use table below for proper placement of thermometer.

Model	Location
PC100	Front, top right corner
PC900, PC1200	Back, right bottom corner
PC2200	Next to upper temperature probe
PC3200	Upper reading: next to upper temperature probe Lower reading: next to lower temperature probe
PC4200	Upper or lower reading: in the middle shelf on the right side

3 Measure chamber temperature.
   - **a** Place independent thermometer per table.
   - **b** Allow chamber temperature to stabilize 30 minutes
   - **c** Obtain and record reading from independent thermometer

4 Calibrate the i.Center readout.

a HOME --> MAIN --> Edit Configuration. --> Enter password

b CONFIGURATION --> Temperature Calibration. Follow system prompts by model type:

Two probe models

Select Temp Probe prompts selection of either Upper or Lower probe.

Press DOWN button until the Temperature option is highlighted.

Single probe models

Upper Temperature Probe is displayed.

Temperature option is highlighted.

c In all models: the *Current temperature* displays as read by the probe or selected probe.

d Use the INC/DEC buttons to match the independent value. The value next to Temperature changes, but the value next to *Current temperature* remains unchanged.

e Press the DOWN button. *Store Calibration* is highlighted.

f Do one:

- ► Save new value. Press ENTER. Message: calibration memorized.
- ► Reject new value. Press the BACK or HOME to exit.

5 Remove independent thermometer from chamber.

CAUTION

- ► The *Current temperature* value may change so that it no longer matches the new value. This is normal.
- ► If a new value is entered, but not saved, that value appears the next time the calibration setting for that probe is viewed.

A.11.2 Test temperature alarms: i.Series

NOTE: Calibrate the i.Center monitor before testing the high and low alarms.

Incubator alarms indicate too high or too low chamber temperatures. i.Series models employ two alarm test methods: automatic and manual.

Automatic method. The built-in Peltier device physically heats or cools the temperature probe. As each setpoint is reached, an alarm sounds, a HIGH (or LOW) ALARM TEST IN PROGRESS message flashes on the i.Center monitor, and an event is added to the event log. No water bath is needed and chamber temperature is unaffected.

After temperatures normalize, the audible and visual alarms clear, and an event is added to the log indicating the high or low temperature alarm was reset. The specific TEST IN PROGRESS message clears, indicating the test is complete. This process can take a few minutes.

Manual method. The temperature monitoring probe is immersed in water. Water temperature is monitored as it is slowly heated or cooled. The temperature at which each alarm activates is read from the i.Center and compared to the known setpoint.

Automatic test

1. Identify the current setpoint to be tested.
2. HOME --> MAIN --> screen --> System Alarm Test & Status
3. Use UP or DOWN to select High or Low Auto Test option.
4. Press ENTER, return HOME. Notice message: ALARM TEST IN PROGRESS. When test is complete, message clears.
5. View event log. Notice value at which alarm activated, and compare to setpoint.

NOTE: If values do not match, see troubleshooting section for guidance.

To cancel automatic test in progress

1. MAIN --> screen --> System Alarm Test & Status
2. Use UP or DOWN to select Cancel High or Low Test.
3. Press ENTER. Test is cancelled.

Manual test

CAUTION Before a manual test, protect stored items from exposure to adverse temperatures.

1. Calibrate the i.Center monitor.
2. Identify current high and low alarm setpoints.

Low temperature alarm

- **a** Fill the tube with test water to 2 inches (50 mm). Place tube in holding bracket and slide upward, immersing the tip of the temperature monitoring probe.
- **b** Watch the temperature reading on the monitor. It should decrease slowly (at a rate of about 0.5 °C per minute). When the temperature reaches the low alarm setpoint, an alarm should sound and the Low Temp alarm should highlight and flash on the i.Center.

High temperature alarm

- **a** Follow the same procedure for the low alarm test, but use the correct temperature test water.
- **b** Dispose of the water, return the tube to the bracket, and position tube below the probe.

PC100i models

Obtain the tube for alarm checks, and water for the high and low alarm tests.

Test water temperature should be at least 1 °C lower than low alarm setpoint, or at least 1 °C higher than high alarm setpoint. For each test, fill tube to 2 inches (50 mm). Avoid using extremely hot or cold test water. Temperature readings should change slowly to identify alarm activation temperatures more precisely.

All other i.Series models

Obtain a container to hold test water, deep enough to immerse probe tip. Volume should be sufficient to hold water added to raise or lower temperature. Opening should be at least 3.25 inches (83 mm) wide to accommodate probe bracket.

Also obtain:

- ► Room-temperature water, at least 1 °C higher than the low alarm setpoint, and at least 1 °C lower than the high alarm setpoint. Fill container to 1 inch (25 mm).
- ► Crushed ice or chilled water for low alarm test.
- ► Hot water for high alarm test.

1. Calibrate i.Center monitor display.
2. Identify current high and low alarm setpoints.
3. Remove agitator(s) for easier access. Loosen probe bracket screws. Slide bracket up and out.
4. (Optional) Bracket is designed to allow testing with upper, longer probe installed, but it is easier to test with probe removed.
   - **a** Near probe tip, unscrew and remove fitting securing probe to bracket.
   - **b** Gently slide probe tip toward bracket until probe is free.

Removing upper temperature probe from probe bracket

5. Immerse probe tip in container of room-temperature water. The i.Center temperature display should be within 1 °C of chamber setpoint, and there should be no active alarms.
6. **Low temperature alarm test (perform first).** Stirring water with probe, add ice or chilled water slowly, and watch i.Center. Temperature decrease should be about 0.5 °C per minute. At low alarm setpoint, audible and visual alarms should activate.
7. **High temperature alarm test**. Follow Step 6, but use hot water.
8. Reinstall and secure bracket, or return the probe to bracket.
   - **a** Gently slide probe tip towards outside of the bracket until tip is about 2 inches (50 mm) from bracket end.
   - **b** Tighten the fitting to secure probe to bracket. Expose about 1 inch (25 mm) of the probe.
   - **c** Reinstall bracket.
9. Return agitator(s) to incubator.

A.11.3 Test other alarms: i.Series

i.Center alarm responses are a two-part sequence. In **Protocol 1**, a setting is changed to simulate alarm conditions. Audible and display alarms activate immediately, and the Event Log records a failure condition. In **Protocol 2**, after the condition is removed, all alarms deactivate, and the Event Log records a reset.

Power failure alarm test

Test the power failure alarm to ensure it activates appropriately. During a power failure, assuming sufficient charge, the backup batteries continue to provide power to the monitoring system.

1. Confirm incubator is connected to AC power.
2. Identify current setting for the power failure timeout.
3. Change setting for the power failure timeout to zero minutes.
4. Confirm key switch for backup battery is turned ON (|).
5. Switch main power OFF (○). The power failure alarm should activate. Protocol 1 initiates.
6. Switch main power ON (|). The power failure alarm should clear. Protocol 2 initiates.
7. Change power failure timeout setting back to original value.

Motion alarm test

1. Confirm the incubator is connected to AC power.
2. Identify the current setting (motion alarm setpoint) for Agitator Alarm 1. See Appendix A.
3. Change both settings to zero minutes.
4. Turn incubator on, and close the door(s) to start agitation:
   a. **For PC4200i:** switch main power ON (|) and close doors.
   b. **For other i.Series incubators and agitators:** switch main power ON (|) and close doors.
5. Stop agitation by opening the door(s). The motion alarm should activate immediately. Protocol 1 initiates.
6. Start agitation by closing the door(s). The motion alarm should clear. Protocol 2 initiates.
7. Change both Agitator Alarm 1 settings back to original values.

Door open alarm test

1. Identify the current setting for the Door Ajar Timeout.
2. Change the setting to zero minutes.
3. Open the incubator door. The alarm should activate immediately. Protocol 1 initiates.
4. Close the incubator door. The alarm should clear. Protocol 2 initiates.
5. Change the setting back to the original value.

No Battery alarm test

Perform to ensure activation when batteries are missing or when charge is so low batteries are undetectable.

1. Turn off incubator and disconnect from AC power.
2. On top of incubator, remove access panel.
3. Remove a battery from the monitoring system array.
4. Connect incubator to AC power.
5. Turn on incubator. The No Battery alarm should activate. Protocol 1 initiates.
6. Turn off incubator and disconnect from AC power.
7. Reinstall battery to the array.
8. Connect incubator to AC power.
9. Turn on incubator. The No Battery alarm should clear. Protocol 2 initiates.
10. Reinstall access panel.

Appendix B Horizon Series controller settings

B.1 View/change temperature alarm

The monitoring and control system has alarms which activate if the temperature is too high or too low. The setpoints for these alarms may be viewed and changed using the temperature controller. The temperature controller is located behind the control door on the front of the incubator.

Temperature controller display and buttons

The High Temperature alarm setpoint (AL.HI) specifies the temperature at which the High Temperature Alarm should activate. If the temperature detected by the chamber probe is greater than or equal to this value, the alarm activates. The default setpoint is 24.0 °C.

The Low Temperature alarm setpoint (AL.LO) specifies the temperature at which the Low Temperature Alarm should activate. If the temperature detected by the chamber probe is less than or equal to this value, the alarm activates. The default setpoint is 20.0 °C.

CAUTION When there is no interaction for one minute, the temperature controller exits program mode and returns to normal mode.

1. On the temperature controller, enter Level 1 program mode by pressing and holding the Up and Down arrow buttons simultaneously for about three seconds until tunE and oFF flash on the display.
2. Press and release the Up or Down arrow button until the parameter to view or change flashes on the display.
   - ► For the High Temperature setting, select the AL.HI parameter.
   - ► For the Low Temperature setting, select the AL.LO parameter.
3. To change the value: While holding the button on the left (*), use the Up and Down arrow buttons to adjust the value in increments of 0.1 °C.
4. When finished adjusting the value, release all the buttons. The value is changed.
5. Exit Level 1 program mode by pressing and holding the Up and Down arrow buttons simultaneously for about 3 seconds until the current chamber temperature displays.

B.2 Change alarm delay settings

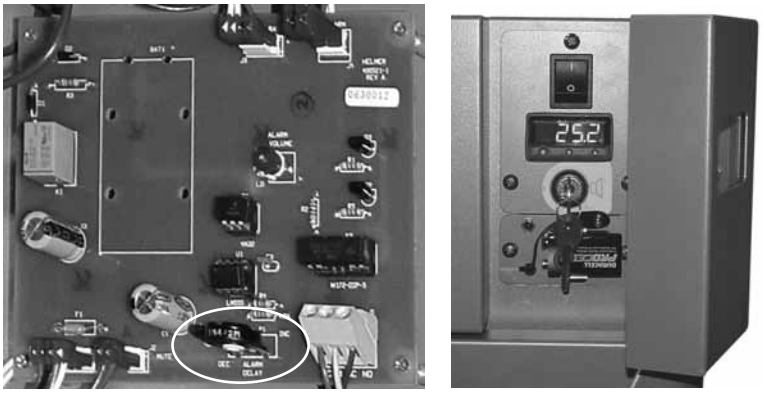
The time lapse between when certain alarm events occur and when the alarms are communicated may be controlled. This amount of time, *the delay period*, is set through the alarm delay control. PC4200h models, which have a built-in agitator, have a additional alarm delay control for the motion alarm.

NOTE: Calibrate the Horizon Series temperature controller before testing the high and low alarms.

B.2.1 Delay temperature alarms

CAUTION Changing the delay period for temperature alarms requires power disconnection from the incubator. Take precautions to protect items in the incubator from extended exposure to adverse temperatures.

It is possible to control how much time elapses between the point the temperature reaches the high or low alarm setpoints, and when the appropriate alarm is communicated. The alarm delay control for temperature alarms is located on top of the incubator under the access panel.



Left: Alarm delay control for temperature alarms (circled). Right: Backup battery for the power failure alarm and key switch (PC100h model).

The delay period set with this control is used for both the high and low temperature alarms. The delay period can be set to a value between approximately 5 seconds and 8 minutes. The default delay period is set at the halfway point (approximately 4 to 5 minutes).

This delay period is also used to set the time for muting the audible high and low temperature alarms.

NOTE: If the delay period is set to 0 minutes, the mute button will have no effect.

CAUTION Changing the delay period for temperature alarms requires removal of the access panel from the incubator. This exposes users to the risk of electric shock.

1. Disconnect the leads from the backup battery for the power failure alarm. This will disable the power failure alarm during the adjustment of the delay period.
2. Turn off the incubator and disconnect it from AC power.
3. On top of the incubator, remove the access panel and locate the alarm delay control on the alarm board.
4. Using a small, flat-head screwdriver, turn the alarm delay control counter-clockwise until it stops. This decreases the delay period to approximately 5 seconds.
5. Using the screwdriver, increase the delay period by turning the alarm delay control clockwise to the appropriate position. Turning the control clockwise until it stops will set the delay period to approximately 8 minutes.
6. To enable the alarm, connect the leads to the backup battery.
7. Install the access panel on the incubator, and connect to AC power.

B.2.2 Delay the motion alarm: PC4200h models.

Alarm delay is the period from when agitation stops to when the alarm is communicated. The alarm delay control for the motion alarm is located on the rear of the incubator.

Alarm delay control for the motion alarm (circled)

The delay period can be set to a value between approximately 5 seconds and 8 minutes. The default delay period is set at the halfway point (approximately 4 to 5 minutes).

CAUTION Avoid leaving the delay period set to 0 minutes. If set to 0 minutes, an alarm will activate immediately whenever the incubator is turned on.

1. On the front of the incubator, enable the audible motion alarm by turning the key switch to Position 1.
2. Using a small, flat-head screwdriver, turn the alarm delay control counter-clockwise until it stops. This decreases the delay period to approximately 5 seconds. The motion alarm should activate immediately.
3. Using the screwdriver, increase the delay period by turning the alarm delay control clockwise to the appropriate position. Turning the control clockwise until it stops will set the delay period to approximately 8 minutes.

B.3 Change alarm volume

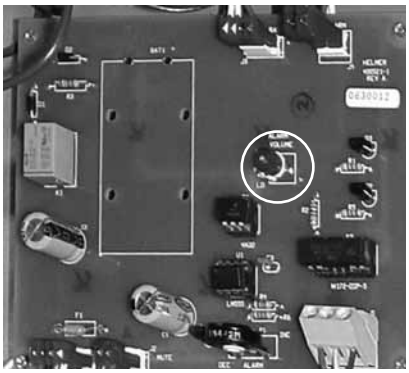
The volume for temperature and power failure alarms is set through the alarm volume control. PC4200h models have an additional alarm volume control for the motion alarm.

CAUTION

- ► Changing the volume for the temperature and power failure alarms requires power to be disconnected from the incubator.
- ► Changing the volume for the temperature and power failure alarms requires removal of the access panel from the incubator. This exposes users to the risk of electric shock.
- ► Take precautions to protect items in the incubator from extended exposure to adverse temperatures.

B.3.1 Change the volume for temperature and power failure alarms

The alarm volume control is located on top of the incubator under the access panel.



Left: Alarm volume control for temperature and power failure alarms (circled).

The volume set with this control is used for all three alarms. The default volume is set at the halfway point (medium).

1. Turn off the incubator and disconnect it from AC power. The power failure alarm will sound.
2. On top of the incubator, remove the access panel and locate the alarm volume control on the alarm board.
3. Using a small, flat-head screwdriver, increase or decrease alarm volume by turning the volume control clockwise to the appropriate position. At the lowest setting, the alarm is very faint but still audible.
4. Install the access panel on the incubator, and connect to AC power.

B.3.2 Change the volume for the motion alarm: PC4200h models

The alarm volume control for the motion alarm is located on the rear of the incubator.

Alarm volume control for the motion alarm (circled)

The audible motion alarm has three volume settings. The default volume is set to the middle setting.Slide the alarm volume control to the appropriate position for the desired volume level.

B.4 Calibration and Testing

CAUTION Before testing, protect stored items from exposure to adverse temperatures.

B.4.1 Calibrate Horizon Series controller display

To ensure high and low temperature alarms activate properly, chamber temperature read by the probe(s) must be accurate. If displayed temperature does not match chamber temperature measured by independent thermometer, determine and enter an offset value to calibrate the controller display.

The display offset can be changed to a value from -100 °C to +100 °C. Values in increments of 0.1 °C can be selected within the range of -10.0 °C to +10.0 °C.

NOTE: If the readout variance is acceptable, calibration is optional.

1 Obtain an independent thermometer, calibrated and traceable per national standards.

2 Use table below for proper placement of calibrated thermometer.

Model	Location
PC100	Front, top right corner
PC900, PC1200	Back, right bottom corner
PC2200	Next to the upper temperature probe
PC3200	Upper reading: next to the upper temperature monitoring probe Lower reading: next to the lower temperature monitoring probe
PC4200	Upper or lower reading: in the middle shelf on the right side

3 Measure temperature in the chamber.

- **a** Place the independent thermometer per table.
- **b** Allow chamber temperature to stabilize for 30 minutes.
- **b** Record independent thermometer temperature and compare to monitor reading.

4 Determine the value needed to match the display to the thermometer reading. This offset value will be entered in Step 5b.

5 Enter Level 3 program mode:

- **a** Press and hold the Up *and* Down arrow buttons simultaneously for three seconds or until tunE and OFF flash on the display.
- **b** Press and release Up or Down arrow button until the LEUL parameter and its value flash on the display.
- **c** While holding the (*) button, press Up or Down arrow buttons to change value to 3.
- **d** Release buttons. LEUL and 3 flash on display. Controller is now in Level 3 program mode.

6 Select Monitor offset (Zero) parameter and adjust the value.

- **a** Press and release Up or Down arrow button until Zero parameter and its value flash on display.
- **b** While holding the (*) button, press Up or Down arrow buttons to reach desired offset value.
- **c** Release buttons. The value is changed.

7 Exit Level 3 program mode by pressing and holding the Up *and* Down arrow buttons simultaneously for three seconds or until the current chamber temperature appears on display.

8 Allow chamber temperature to stabilize, and check the monitor display. Repeat process if needed.

9 Remove independent thermometer from chamber.

B.4.2 Test temperature alarms: Horizon Series

To test low and high temperature alarms, a chamber probe is immersed in water that is slowly cooled or heated. Alarm activation points are read on the display and compared to the programmed setpoint(s).

PC100h models

Obtain the tube for alarm checks. For each test, fill tube to 3 inches (76 mm). Avoid using test water that is extremely cold or hot. Test water should be at least 1 °C lower than the low alarm setpoint, or at least 1 °C higher than the high alarm setpoint. Temperature readings should change slowly in order to identify alarm activation temperatures more precisely.

1. Calibrate the controller monitor display.
2. Identify current high and low alarm setpoints.

Low alarm test (perform first)

- **a** Fill tube with test water. Place tube in holding bracket and slide upward to immerse probe tip.
- **b** Watch monitor. Temperature should change slowly (about 0.5 °C per minute). When low alarm setpoint is reached and alarm delay period elapses, audible and visual alarms activate.

High alarm test

- **a** Follow the low alarm test procedure, but with hot water.
- **b** Empty tube, return to bracket, and position below probe.

All other Horizon Series models

Obtain a container to hold test water, deep enough to immerse probe tip. Volume should be sufficient to hold water added to raise or lower temperature. Opening should be at least 3.25 inches (83 mm) wide to accommodate probe bracket.

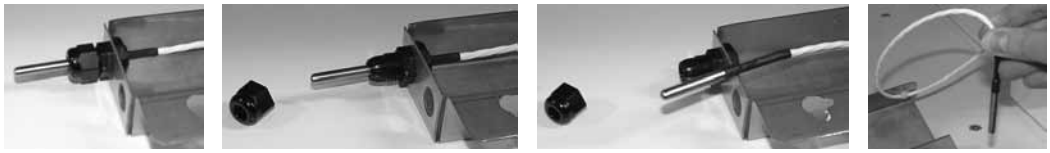
Also obtain:

► Room-temperature water, at least 1 °C higher than the low alarm setpoint, and at least 1 °C lower than the high alarm setpoint. Fill container to 1 inch (25 mm).

► Crushed ice or chilled water for low alarm test.

► Hot water for high alarm test.

1. Calibrate Horizon controller display.
2. Identify current high and low alarm setpoints.
3. Remove agitator(s) for easier access. Loosen probe bracket screws. Slide bracket up and out.
4. (Optional) Bracket is designed to allow testing with upper, longer probe installed, but it is easier to test with probe removed.
   - **a** Near probe tip, unscrew and remove fitting securing probe to bracket.
   - **b** Gently slide probe tip toward bracket until probe is free.



Removing the temperature control probe from the probe bracket.

5 Immerse probe tip in container of room-temperature water. The Horizon controller display should be within 1 °C of chamber setpoint, and there should be no active alarms.
6 Low temperature alarm test (perform first). Stirring water with probe, add ice or chilled water slowly, and watch the display. Temperature decrease should be about 0.5 °C per minute. At low alarm setpoint, an alarm should sound and -AL- and the red alarm light should both flash.
7 High temperature alarm test. Stirring water with probe, add hot water slowly, and watch the display. Temperature increase should be about 0.5 °C per minute. At high alarm setpoint, an alarm should sound and -AL- and the red alarm light should both flash.
8 Reinstall and secure bracket, or return the probe to bracket.
   a Gently slide probe tip towards outside of the bracket until tip is about 2 inches (50 mm) from bracket end.
   b Tighten the fitting to secure probe to bracket. Expose about 1 inch (25 mm) of the probe.
   c Reinstall bracket.
9 Return agitator(s) to incubator.

B.4.3 Test other alarms: Horizon Series

Power failure alarm test

Test the power failure alarm to ensure activation. During a power failure, assuming sufficient charge, backup batteries provide power to this system.

1 Confirm the incubator is connected to AC power and the leads are connected to the backup battery for the monitoring system.
2 On the front of the incubator, enable the audible temperature and power failure alarms.
   ► **For PC4200h models**: turn the key switch to Position 2 to enable the audible temperature and power failure alarms, but disable the motion alarm.
   ► **For all other Horizon incubator models**: turn the key switch ON (|).
3 Turn off incubator. Switch main power OFF (○).
4 Disconnect incubator from power. The power failure alarm should activate immediately.
5 Connect incubator to power. The power failure alarm should clear.
6 Turn on incubator. Switch main power ON (|).

Motion alarm test: PC4200h models only

PC4200h models

1 Confirm the incubator is connected to AC power.
2 On the front of the incubator, enable the audible motion alarm by turning the key switch to Position 1.
3 Start agitation. Switch main power ON (|).
4 Stop agitation by opening the door(s) on the incubator. After the motion alarm delay period elapses, the motion alarm should activate, causing an audible alarm to sound.
5 Start agitation by closing the door(s) on the incubator. The motion alarm should clear.

Appendix C Warranty

Rel.i™ Product Warranty USA and Canada

For technical service needs, please contact Helmer at 800-743-5637 or www.helmerinc.com. Be sure to have the model and serial number available.

Rapid resolution

When a warranty issue arises it is our desire to respond quickly and appropriately. The service department at Helmer is there for you. Helmer will oversee the handling of your warranty service from start to finish. Therefore, Helmer must give advance authorization for all service calls and/or parts needs relating to a warranty issue. Any repeat service calls must also be authorized as well. This allows for proper diagnosis and action. Helmer will not be responsible for charges incurred for service calls made by third parties prior to authorization from Helmer. Helmer retains the right to replace any product in lieu of servicing it in the field.

Compressor

For the warranty period listed below, Helmer will supply the refrigeration compressor, if it is determined to be defective, at no charge, including freight. Helmer will not be liable for installation, refrigerant, or miscellaneous charges required to install the compressor beyond the first year of the warranty period.

- i.Series model compressor warranty period is five (5) years.
- Horizon Series model compressor warranty period is three (3) years.

Parts

For a period of two (2) years, Helmer will supply at no charge, including freight, any part that fails due to defects in material or workmanship under normal use, with the exception of expendable items. Expendable items include glass, batteries, and door gaskets. Inspection of defective parts by Helmer will be final in determining warranty status. Warranty procedures must be followed in all events.

Labor

Floor models

For a period of one (1) year, Helmer will cover repair labor costs (including travel) and the cost of refrigerant and supplies necessary to perform authorized repairs. Repair service must be performed by an authorized Helmer service agency following the authorization process detailed above. Alternatively, your facility's staff may work with a Helmer technician to make repairs. Labor costs for repairs made by unauthorized service personnel, or without the assistance of a Helmer technician, will be the responsibility of the end user.

Countertop models

For a period of one (1) year, Helmer will cover repair labor costs, provided the product is returned to Helmer for warranty service. Alternatively, your facility's staff may work with a Helmer technician to make repairs on site. Labor costs for repairs performed at a location other than Helmer, or for repairs made without the assistance of a Helmer technician, will be the responsibility of the end user.

Additional warranty information

The time periods set forth above begin two weeks after the original date of shipment from Helmer. Warranty procedures set forth above must be followed in all events.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY.

THE LIABILITY, IF ANY, OF HELMER FOR DIRECT DAMAGES WHETHER ARISING FROM A BREACH OF ANY SALES AGREEMENT, BREACH OF WARRANTY, NEGLIGENCE, OR INDEMNITY, STRICT LIABILITY OR OTHER TORT, OR OTHERWISE WITH RESPECT TO THE GOODS OR ANY SERVICES IS LIMITED TO AN AMOUNT NOT TO EXCEED THE PRICE OF THE PARTICULAR GOODS OR SERVICES GIVING RISE TO THE LIABILITY. IN NO EVENT SHALL HELMER BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES, INCLUDING WITHOUT LIMITATION DAMAGES RELATED TO LOST REVENUES OR PROFITS, OR LOSS OF PRODUCTS.

This warranty does not cover damages caused in transit, during installation by accident, misuse, fire, flood, or acts of God. Further, this warranty will not be valid if Helmer determines the failure was caused by a lack of performing recommended equipment maintenance (per Helmer manual) or by using the product in a manner other than for its intended use. Installation and calibration are not covered under this warranty agreement.

Outside of USA and Canada

Consult your local distributor for warranty information.

Appendix D Specifications

NOTE: See also Incubator Operation manual, Section 3 for power specifications.

D.1 i.Center monitoring system screen reference

This section applies to i.Series models.

HOME screen

MAIN button

MAIN screen

MUTE button (changes mute timer)

MAIN screen

Event Log option

(Press the SELECT button)

EVENT LOG screen

EVENT LOG DETAIL screen

System Alarm Test & Status option

SYSTEM ALARM TEST & STATUS screen

Start High Alarm Auto Test option

Start Low Alarm Auto Test option

Cancel High or Low Test option

Chart Paper Days Left or **Chart Paper Timer** display

Door Status display

Condenser Temp display

Edit Configuration option

(Enter the password)

CONFIGURATION screen

Set Date & Time option

SET DATE & TIME screen

System Options option

SYSTEM OPTIONS screen

Language option

Alarm Volume option

Alarm Pulse option

Temperature Units option

Temperature Graph option

Chart Paper Timer option

Alarm Setpoints option

SET ALARM SETPOINT screen

High Alarm Setpoint option

Low Alarm Setpoint option

Cond. Alarm Setpoint option

Door Ajar Timeout option

Power Failure Timeout option

Agitator Alarm Setpoints option

AGITATOR ALARM SETPOINT screen
Agitator 1 Setpoint option
Agitator 1 option
Agitator 2 Setpoint option
Agitator 2 option
Agitator 3 Setpoint option
Agitator 3 option
Temperature Calibration option
TEMPERATURE CALIBRATION screen
Select Temp Probe option or **Upper Temperature probe** display
Temperature option
Factory Default Settings option
FACTORY DEFAULT SETTINGS screen
Change Password option
(Enter a new password)
View Configuration option
VIEW CONFIGURATION screen
Clock Mode display
Date Format display
Door Ajar Timeout display
Pwr Failure Timeout display
High Alarm Setpoint display
Low Alarm Setpoint display
Cond. Alarm Setpoint display
Alarm Volume display
Alarm Pulse display
Chart Paper Days Left or **Chart Paper Timer** display
Agitator Alarms display
Temperature Graph display
Product/Company Information option
INFORMATION screen
i.Help option
i.Help screen
Agitator Information option
AGITATOR INFORMATION screen
Agitator RPM option
AGITATOR RPM screen
Agitator Cycles option
AGITATOR TOTAL CYCLE COUNT screen
Reset option
RESET AGITATOR screen
Agitator Count Logs option
AGITATOR COUNT LOGS screen

D.2 Alarm reference

If an alarm condition is met, an alarm activates. Some alarms are visual, while others are visual and audible. Some alarms are sent through the remote alarm interface.

The table below indicates if an alarm for a particular model is audible (A), visual (V), or sent through the remote alarm interface (R). Messages for visual alarms, if applicable, appear in the table as well. Additional information about applicability is noted below the table.

Alarm	Incubator models	
	i.Series	Horizon Series
Door Open	A, V (“Door Open”), R	
High temperature	A, V (“High Temp”), R	A, V (“-AL-”), R
Low temperature	A, V, (“Low Temp”) R	A, V (“-AL-”), R
Condenser temperature	A, V (“Condenser Over-Temp”), R	
Low battery	V (“Low Battery”)	
No battery	A, V (“No Battery”), R	
AC power failure	A, V (“AC Power Failure”), R	A, R
Change chart paper[1]	V (“Change Chart Paper”)	
Agitator 1 motion alarm[2]	A, V (“Agitator 1 Stopped”), R	A (PC4200h), R
Agitator 2 motion alarm[3]	A, V (“Agitator 2 Stopped”), R	R[5]
Agitator 3 motion alarm[4]	A, V (“Agitator 3 Stopped”), R	R[5]

[1]The Change chart paper alarm applies if a temperature chart recorder is installed. Additional alarms may be available on the chart recorder. See the Temperature Chart Recorder Operation and Service Manual.

[2]The Agitator 1 motion alarm applies to all PC4200 models, but for all other models, this alarm applies if the agitator installed at this position is a Helmer i.Series model.

[3] The Agitator 2 motion alarm applies to PC2200 and PC3200 models that have a Helmer i.Series model agitator installed at this position.

[4]The Agitator 3 motion alarm applies to PC3200 models that have a Helmer i.Series model agitator installed at this position.

[5]The Agitator 2 and 3 motion alarms do not apply for PC4200h models.

D.3 Additional specifications

D.3.1 Calibration range

The calibration range is -40 °C to +40 °C.

D.3.2 Supplies

Refrigerant: non-CFC, R134A

D.4 Energy conservation

- ► Insulation Type: 2
- ► Pollution Degree: 2 (for use in USA and Canada)
- ► This product is certified to applicable UL and CSA standards by a NRTL.

D.5 CE compliance

The CE symbol (right) indicates this device complies with the requirements of directive 93/42/EEC concerning Medical Devices, as amended by 2007/47/EC.

D.6 WEEE compliance

The WEEE (waste electrical and electronic equipment) symbol (right) indicates compliance with European Union Directive WEEE 2002/96/EC and applicable provisions. The directive sets requirements for the labeling and disposal of certain products in affected countries.

When disposing of this product in countries affected by this directive, ensure:

- ► Do not dispose of this product as unsorted municipal waste.
- ► Collect this product separately.
- ► Use the collection and return systems available locally.

END OF MANUAL

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